

JPRS 76008

8 July 1980

# East Europe Report

SCIENTIFIC AFFAIRS

No. 678

**FBIS**

FOREIGN BROADCAST INFORMATION SERVICE

#### NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [ ] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

#### PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Indexes to this report (by keyword, author, personal names, title and series) are available from Bell & Howell, Old Mansfield Road, Wooster, Ohio 44691.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

8 July 1980

EAST EUROPE REPORT  
SCIENTIFIC AFFAIRS

No. 678

## CONTENTS

## INTERNATIONAL AFFAIRS

- Range of CEMA Produced Computers, Use Outlined  
(Stoyko Chavdarov; RADIO, TELEVIZIYA, ELEKTRONIKA,  
No 3, 1980) ..... 1

## BULGARIA

- Academician Angel Balevski: His Life, Achievements  
(SPISANIE NA BULGARSKATA AKADEMIYA NA NAUKITE,  
No 2, 1980) ..... 5

Academician Zarev on Balevski, by Panteley Zarev  
Balevski's Contributions Praised, by Lyubomir Kaley

- Reports on Scientific Achievements, New Technologies  
(SPISANIE NA BULGARSKATA AKADEMIYA NA NAUKITE,  
No 2, 1980) ..... 19

## CZECHOSLOVAKIA

- Success With Early Animal Embryo Transplant Reported  
(Various sources, various dates) ..... 24

Transplant Methods, Experiences, by Lucia  
Zuberova, Karol Fisera  
Transplant Utilization, Prospects, by  
Pavel Majerciak, et al.

## Abstracts

- Biomedical and Behavioral Sciences ..... 32

## GERMAN DEMOCRATIC REPUBLIC

Possibilities of Genetic Engineering Discussed (Michael Strauss; NEUES DEUTSCHLAND, 26-27 Apr 80)....	33
Trends in Industrial Microbiology Noted (Guenter Vetterlein; DIE WIRTSCHAFT, 6 Mar 80).....	36

## HUNGARY

### Abstracts

Biomedical and Behavioral Sciences .....	44
--	----

## POLAND

New Laser Control Systems Described (Wladyslaw Goral; POMIARY AUTOMATYKA KONTROLA, May 80)	49
New, Cheap Infrared-Detector Mass Production Method Developed (Jozef Piotrowski Interview; PRZEGLAD TECHNICZNY INNOWACJE, 11 May 80) .....	52
Polish Academy of Science Activities, Personnel (NAUKA POLSKA, Dec 79) .....	57
Briefs	
Logabax Computer Installations	64
Main Statistical Office Computers	64
Energy Ministry Computer System	64
Electrical Engineering Institute Computer	64
Computer Science, Production Decline	64
Abstracts	
Biomedical and Behavioral Sciences.....	65

## YUGOSLAVIA

### Abstracts

Biomedical and Behavioral Sciences.....	66
---	----

## INTERNATIONAL AFFAIRS

### RANGE OF CEMA PRODUCED COMPUTERS, USE OUTLINED

Sofia RADIO, TELEVIZIYA, ELEKTRONIKA in Bulgarian No 3, 1980 pp 2, 3

[Article by Engr Stoyko Chavdarov, chief director of the Electronization Directorate at the Ministry of Electronics and Electrical Engineering: "The Contribution of Electronics Production to the Electronization of the National Economy"]

[Text] In carrying out the scientific and technical policy elaborated by the 11th Party Congress and the decisions of the July (1979) Plenum of the BCP Central Committee, and in accord with the requirements and most recent trends in the present-day scientific and technical revolution, Bulgarian electronics is developing steadily and rapidly. It is playing an ever greater role in introducing the achievements of the scientific and technical revolution into the national economy.

At the end of 1977, the Politburo of the BCP Central Committee approved and the Council of Ministers ratified the Comprehensive Program for the Electronization of the National Economy and Social Life in the Seventh Five-Year Plan and up to 1990. In terms of its importance and scope, the Program was established as a national program of strategic significance.

The role and significance of the electronization of the national economy have grown year after year, and this has led to a sharp rise in social labor productivity and the intellectualization of labor. It has led to a many-fold reduction in the expenditures of raw products, materials, energy and fuel in production; to a rise in product quality; to the raising of management activities to a high level and an improvement in them.

Electronization involves several basic determining factors.

In the first place, the presence of the necessary systems, the modern electronic and microelectronic equipment, modern electronics and software is related to specific problems of production and control. Secondly, the availability of well-trained specialists in the scientific research and design organizations and institutes who can successfully and most effectively introduce this equipment and systems into the elaborated plans for new, modernized and reconstructed projects or into newly developed highly automated machines, units and lines.

Thirdly, there is the definite knowledge and understanding of the economic leaders and specialists of the great role and opportunities for electronization, and of the active effect which it has on a large part of the processes in the renovation and modernization of production, management, services and the everyday life of the people. Of great importance for realizing these possibilities is to ensure the conditions for a high operational level of the electronic equipment and corresponding systems, and as was said, the skillful leadership and introduction of electronization in the economic organizations and enterprises.

All of the three designated factors would be the subject of a larger and more thorough investigation, while the present article will take up only certain aspects of the importance and role of the first of them, that is, the availability of modern electronic and microelectronic equipment with high technical, economic and operational capabilities, modern instruments and equipment for automation and systems, and modern electronic equipment and the necessary software.

At the international exhibit held in Moscow in June-July 1971 demonstrating the achievements of the socialist countries in the area of microelectronics, computer technology and control systems, it was clearly evident that the socialist nations are already producing and developing production of an entire range of systems and electronic equipment which will provide an opportunity for the socialist countries, including our own, to accelerate the electronization of the national economy. The over 120 automated control systems demonstrated at the exhibit for all sectors and activities in the national economy substantiated this.

Our nation, as is known, is in the leading ranks of the producers of modern electronic and electronic computer equipment.

Together with the USSR and the other socialist countries, significant efforts are being made to develop, assemble and introduce entire software-hardware and special problem installations and systems with application for a broad range of consumers in the automating of production and control. Since the start of the Eighth Five-Year Plan, there were plans to introduce special problem installations in trade, agriculture, the state savings banks, warehousing, and so forth. Due to the importance of this problem for the electronization of the national economy, priority will be given to the development and introduction of them.

In the CEMA countries, an entire range of universal electronic computers (installations) has been developed and is already in production. These include the ES-1015, ES-1022, ES-1033, ES-1035, ES-1040, ES-1045, ES-1055 and ES-1060 with the required peripheral equipment and software. These provide an opportunity for successfully setting up and introducing automated control systems, including for operational control of production, control over the technical preparations of production and the automation of scientific research, engineering and design activities.

The USSR and a number of the socialist countries have successfully begun series production of a unified system of minicomputers (SM EIM) with the corresponding peripheral equipment.

In 1980, our nation will begin producing some of these minidevices. The USSR already produces a whole series of microcomputers based on micro-processors. These mini- and microcomputer systems can be successfully employed in working out designs to automate individual units, lines, sections and various production processes.

The microprocessor units which are already in production in the USSR and are being developed in our nation and the other socialist countries can be provided and introduced in automating individual machines and units, and in creating the modular principle for new microelectronic equipment and special scientific devices.

Just several specific examples can suggest what a significant effect for the national economy is provided by the introduction and use of modern electronic and microelectronic equipment.

The use of the digital program controls which are produced in Bulgaria for metal cutting machines leads to a double or triple rise in the productivity of the machines, to a significant broadening of their functional capabilities and to the achieving of high accuracy in processing very complicated pieces.

The introduction of thyristor controlled electric drive with high-torque electric motors for modern metalworking machines leads to a significant simplification of the design and weight of the machines and to a savings of electric power of up to 20 percent. It also leads to a significant increase in the degree and smoothness of control, to the creation of possibilities for setting up a system of controllable machines. Three types of complete electric drives for feed movements of metal cutting machines with digital program control are being produced, and by the end of 1981 a whole family of four sizes with a total of 11 electric drives will be in production.

The broadening of work in the area of reconstructing the subscriber heating stations at administrative buildings and housing with the introduction of electronic heat controls leads to a significant savings in fuel and to the creation of better conditions and comfort in the heated rooms.

The successful introduction of the electronic control systems which are in series production in our country on a number of farm machines will contribute to a significant economic effect in agriculture.

The electronic systems for automating designer labor and which are already in use at certain textile enterprises of the nation will provide a many-fold rise in labor productivity here.

Automation of financial and bookkeeping activities in the economic organizations and plants can be widely carried out with the regular production of the IZOT-250 microprocessor information systems which will start this year. The IZOT-250 system will be used as an organizational system in agriculture as well in accounting for product in livestock raising and crop raising, in selling the agricultural products, in money transactions with the bank, and so forth.

A number of problems related to automating individual processes and units are being successfully solved at the Gabrovo VMEI [Higher Electrical Machinery Institute], the Varna VMEI, at the Central Scientific Research Laboratory for Full Automation, the Central Laboratory for Automation under the Ministry of Chemical Industry, and elsewhere.

The plan of the Ministry of Electronics and Electrical Engineering for 1980-1981 anticipates that the production of electronic equipment and systems will increase by about 12-13 percent.

Thus, the state and possibilities of the electronics industry in our nation, in the USSR and the other socialist countries in 1980 and the first years of the Eighth Five-Year Plan provide the real prospects for a significant acceleration in carrying out the national comprehensive program for the electronization of our national economy and social life.

The process of the electronization of our national economy leads the way to higher efficiency.

10272  
CSO: 2202

ACADEMICIAN ANGEL BALEVSKI: HIS LIFE, ACHIEVEMENTS

Academician Zarev on Balevski

Sofia SPISANIE NA BULGARSKATA AKADEMIYA NA NAUKITE in Bulgarian No 2, 1980

[Article by Academician Panteley Zarev]

[Text] On every occasion after a longer conversation with him, unwittingly my mind has turned to the past, to the history of the Bulgarian intelligentsia. This intelligentsia grew up spiritually under the influence of two big historical and patriotic movements: the Bulgarian Renaissance and socialism. In both of these ages it developed virtues which were passed on through the years from generation to generation. The Bulgarian Renaissance was an exceptional period in terms of its purpose and aims. The lives of the great figures of that age were entirely subordinated to the great patriotic ideals. These people feared no difficulties. They were ready for sacrifice, working under the conditions of a terrible coercive system. Their hearts were the centers of life-bearing patriotic ideals. This applied not only to those who, in exile, were working for Bulgaria's liberation, but to the working people in the country, the thousands of patriotic teachers, church leaders, and intellectuals who contributed to the completion of this cause.

The appearance of socialism in Bulgaria was a new ideological wave in history, and a new test of the spiritual forces of the intelligentsia linked with the people. The left wing socialists who served their great ideal adamantly and with total dedication, developed high moral virtues. They conquered all difficulties. No accident could make them deviate from their way, for their beliefs and unbreakable moral will stood above everything else. Like the men of the renaissance, the left wing socialists were pure patriots.

I bring to mind these pure and bright virtues of the Bulgarian intelligentsia, for I see that something of them has been transferred to Balevski's character and spirit. This includes total patriotism, the invincible hope that the Bulgarian ideal will prevail, and inordinate faith in progress and the priceless value of moral sincerity. These



striking features and noble virtues stand out in this contemporary heir of the Bulgarians of the past. He has something of the renaissance spirit of our pre-liberation intelligentsia, the thrust toward free thinking, and the pioneering self-denial of our left wing socialists who, later, led the spiritual advancement of liberated Bulgaria. He has yet another quality, his tendency to interpret the great accomplishments of philosophy and of the world's cultural progress. These features and qualities developed in Balevski a long time ago, during his adolescence and youth, remaining untouched by time to this day, to the memorable anniversary of his 70th birthday.

Born in Trilash, on 15 April 1910, he carried within himself the national spirit of the enlightened Balkan families of this old Bulgarian settlement, while his roots are even deeper, somewhere in the very old Macedonian-Bulgarian lands. He identified love for Mother with love for homeland and love for homeland with love for Mother. Having lost his father at an early age—his father died at the age of 11 from tuberculosis—he was drawn toward his mother who assumed all concern for education and for the abounding and moral development of the young man with his scientific integrity and daily practical wisdom, qualities inherent in a youth open to patriotic hopes. The fact of having no father helped the young man, strengthening his resolve to be independent and his inflexible will to make something of himself. From an early age he was helped in two inclinations: one toward technology and the other toward the humanities. Balevski graduated in machine engineering in Brno, Czechoslovakia. Returning to Bulgaria, he actively worked in industry, participated in the creation of metal processing enterprises, and designed machines and assembled equipment in the field of metal casting. At the same time, even though an engineer, he read books on philosophy, history, and art. His interest in beauty, in music and theater did not diminish. However, what attracted him most were his family and his people. Fortunately, one did not hinder the other. The engineer did not refuse the enlightened mind of the humanist to seek and study with the same persistence which he, the engineer, engaged in the study of new metal casting technologies.

In later years Balevski pursued his independent and highly moral education, worthy of a Bulgarian, and of a person possessing a broad and progressive socially oriented mind. Without being the author of many or thick works on the humanities, he has done a great deal to promote and advance the knowledge of the humanities among his colleagues, technicians and engineers, and for the development of sciences such as Bulgarian history and Bulgarian linguistics.

A strange phenomenon developed: A prestigious scientist in his field was promoting the advancement of other sciences without authoring works on their subjects. Let me point out yet another quality in Balevski which particularly impresses anyone who has met or been close to him: his optimism, wit, his inexhaustible humor, his ability to retrieve from his memory a precise joke which would lead the company into disconcerting humor and talk characteristics, entertaining and cheering up the people. I have described Balevski as a mobile museum of the humor culture of our people. I do not think that I was wrong. Whenever people have gathered around him there have been smiles, and a spiritual gaiety pouring out of a living artistic heart. Had he failed to develop as a historian or a humanist in general, he would have failed to develop as an actor. This has always encouraged him to engage in gaiety in which, occasionally, we hear the merciless sound of Bulgarian self-critical humor. It is perhaps no accident that Academician Balevski has frequently admitted to me his love for Ivan Vazov, the author of "Pod Igoto" (Under the Yoke) and "Chichovrai" (Uncles), and for Aleko Konstantinov.

The reason for this long introduction in which I speak not of the scientific accomplishments but of the spirituality of Academician Balevski, chairman of the Bulgarian Academy of Sciences, is because, without it, I would have been unable to describe the spiritual coordinates of his personality, of the richness of his character, of everything patriotic, moral-heroic, and selfless, which has frequently amazed others as the extension of the loftiest moral virtues of the Bulgarian intelligentsia.

But here are some data of his professional biography. In 1943 he was appointed professor extraordinary at the State Polytechnical School, where he created and headed the chair on machine technology. Subsequently, the chair developed into the department of metal studies and metal technology of the Machine-Electrical Engineering Institute. Since 1947, along with teaching, he has headed a design group in charge of building plants throughout the country. The plan of this collective were used in building the Chervena Zvezda plant in Debelets, the Georgi Kirkov plant in Sofia, and the Metal Cutting Machines Plant in Sofia. Subsequently, this design collective developed into the design organizations of the Ministry of Industry. In 1951 he was elected corresponding member of the Bulgarian Academy of Sciences, and headed the Metal Studies and Metal Technology Section which developed and, in 1967, became the Institute for Metal Studies and Metal Technology, whose director he still is. From 1966 to 1967 he was the rector of the Higher Machine-Electrical Engineering Institute. In 1967 he was elected academy member and, in 1968, chairman of the Bulgarian Academy of Sciences.

His more recent works deal with the testing and study of the properties of metals and metal alloys. Another group of his works covers the influence of mechanical vibrations on metal aging processes; a third group deals with studies of structural changes in metals influenced by heat, and so on. Prof Ivan Dimov and he co-authored a remarkable new discovery: a method for counterpressure casting, patented in all developed industrial countries.

Academician Balevski notes in his autobiography that, after his return from Czechoslovakia as a graduated engineer he remained for a while unemployed and was able to realize the material backwardness of our country. This may have encouraged his desire, which has lasted over so many decades, to adamantly work for the development of metal studies in Bulgaria, make discoveries in this field, train cadres, and strengthen the economic base of socialism. Indeed, his most important contributions in the field of metal castings--the development of new metal alloys and materials and methods and equipment--is the product of his will. He created a tradition which cannot be inert or fail to influence the further development of metal casting and the broadening of the range of scientific discoveries.

But let others discuss his scientific accomplishments which have earned him the recognition at home and abroad. They would be able to seek and

Finally, better than I, the national-biographical significance of Balovski's contribution is what he dedicated most of his life, let me rather stress his literary work, his spiritual pathos, and his dedication to Bulgaria, viz., his features as a social personality, of the person added to the scientific and who yet serves the scientist in a way.

Balovski has never liked science for its own sake. As I pointed out, even in his youth, regarding his profession, he thought of other things which science could and should serve. He has retained this attitude toward scientific knowledge throughout his life, even when revolving very specific technical or technological problems. Allow me to say that it is precisely in virtue of this moral and political view of scientific knowledge and of its importance to me that Balovski stands out as a teacher and guide of the younger generations. He teaches them to dedicate themselves to science without, however, neglecting their social obligations. Such was the high-loung theme of the greatest teachers in the history of science. Balovski himself stresses that science is not merely knowledge but enlightenment, i.e., an understanding of the need to serve man, the people, mankind. He has encouraged in developing this concept of the scientific Bulgarian reality, the past of our people, and the backwardness of our country. He struggled for its success precisely as a citizen.

The reason for this high moral duty should be sought in his character, in his moral standard, in the fact that he was not tempted by scientific discoveries for their own sake, or by the vanity of the academic scientist. Instead, he felt his ties with the people, with the history of the country, and, I would add, with current politics. It is precisely this that elevated him as a supporter of maximum efforts in scientific discovery. It was this that intensified and enriched his vocation. It encouraged him to be overthere and with everyone working for the good and progress of Bulgaria. He has never found another greater temptation. I have witnessed the respect which Balovski has shown for useful books or for a scientific discovery important to the country. He has expressed his admiration for our colleagues actively dedicated to a scientific task and who would begin and end their day in their work laboratory. He respects the great laboriousness of the scientist, the steadfastness which yields results. However, looking at results, he always thinks of the country and the people--his people for whom he feels a kind of fatal love.

Balovski considers science a tireless work, a permanent aspiration to study the secrets and laws governing nature and society and human behavior. He has always considered these major problems with a slight dose of philosophy. This has been a source for a higher scientific inspiration. I have been with him in a natural environment. We have spent hours discussing the secrets of the micro- and macroworld and of man who, through his perfection, reflects and embodies the highest

achievements of nature. In the course of such conversations and contemplations as well Balevski has sought moral values, recalling either great writers or great philosophers and scientists.

Academician Angel Balevski has dealt with several basic problems as a teacher, chairman of the Academy of Sciences, or rank and file citizen. Allow me to point out some of them. Let me first stress the question of education. In a way this question has always been present in his mind and has been emphasized in various circumstances. Balevski believes that we must catch up with the advanced nations, and that we must develop knowledge and strength through which we would catch up with those who are ahead of us in world progress. It is the hard historical lot of our people and our backwardness that triggers and makes necessary a faster development. Education is precisely the main factor in our historical subject, i. e. Without it we would be unable to create either a material or a spiritual culture. Without it we would be unable to make a contribution in domestic and world history. Balevski considers education quite broadly, as the gathering of knowledge, professional training, development of virtues, and surmounting negative features in ourselves and in some people's strata. He believes that education means to struggle for all-round enhancement, for a future which will take us to the level of the most advanced countries. That is why he admires every success and is alarmed and saddened by any failure. That is also why the problem of education has been, and remains, his tireless concern, as a professor at the Higher Machine-Electrical Engineering Institute, and now, as chairman of the Bulgarian Academy of Sciences.

Another problem which concerns him is that of the dignity of our people. Imbued with the pure and selfless patriotism of the enlighteners and the humane principles of socialism, Academician Angel Balevski, light the thinking segment of our intelligentsia and the leaders of our country, is always aware of his responsibility to the people, of the trust of the people, and the dignity of the people. Whatever difficulties may arise, this is a permanent problem facing Balevski in its entire contemporary historical significance. His criticism is always open, honest, and sharp, for deep behind it is his pain for the failure of the people, of our nation, to realize their potential, and his concern for our national dignity. As chairman of the Academy of Sciences he has categorically opposed the nihilistic attitude toward our past and those who deny the people's virtues and our material and cultural accomplishments. This has led him to interfere even in areas in which he is not a specialist, such as history and archeology, linguistics, or literature. Those who have disappointed him and toward whom he has occasionally behaved quite sternly, have probably not always understood his reasons or the major lines followed by his mind and feelings.

Democratic and proper in his relations with the people, he becomes a different person if forced to fight against anything against Bulgaria, anything that is against the people or is dishonest, against anything

which influence our people and country, and any minimum in our national possibilities. For that same reason Balovski has also been sharp and unsympathetic toward lack of talent, ignorance, and the morally cowardly and decadent people. Meeting such people he becomes agitated and finds it hard to keep his self-control should he openly be unable to call them the truth, seeking above to get rid of them as soon as possible.

Everything which Balovski does as organizer and leader of science assumes for a considerable share of his activities. He is the author of a number of bigger or smaller works, some of them written, others verbal and improvised and recorded as minutes. In such works he intelligently deals with the most important problems of the organization and tasks of our science, the role of the Bulgarian Academy of Sciences, our national life, and the nature of the scientific and technical revolution. I will even say that he is engaged in this creative matter on an almost daily basis. In all conversations or meetings he skillfully guides and even repairs speaking which might be significant as a conclusion or result.

Academician Angel Balovski can see all such organizational and, I would say, pedagogical problems in their dynamics, dependent on the dynamic changes in life. Some of his ideas, presented verbally or in writing, are subsequently developed and, in a talented way, presented to the audience in a more expanded and systematized aspect. He combines two methods of thinking: closeness to reality and freedom, independence from reality, and an ability to creatively develop and clarify it further. The scientist in him does not acknowledge any science which operates with falsified data; the organizer and manager of science in him does not retain permanent concepts but can sense the trends of life and can fight for them. Such is precisely what Academician Angel Balovski tries to be as chairman of the Bulgarian Academy of Sciences, as a realistic patriot promoting the major role of the academy in our national life, and as the head of an institution which is influencing to an ever greater extent the progress of our country and the intellect and spirit of the people.

I cannot ignore one another important activity of Academician Angel Balovski which, in terms of its significance, exceeds the borders of our country. His activities as an inflexible defender of the peace, as a member of the Pugwash Movement. This is perhaps because the scientist is very well aware of the nature of a future war, perhaps by virtue of his interest in the advancement and successes of our country, possible under powerful conditions, or, perhaps, because of feeling morally obliged by his high level humanity. Balovski is exceptionally dedicated to the noble aims of the Pugwash Movement. He successfully combines the characteristics of the patriot and the internationalist. Closely linked with his people, having experienced many trials and struggles, Balovski feels the need to support all nations on earth which follow the path of progress.

In conclusion, let me recall a category frequently mentioned in his vocabulary. Writing or speaking, he likes to use the words "critical volume." A critical volume may be found in an industry which, however intensively developed, can realize its potential on the basis of certain material factors. A critical volume may be found in a nation which cannot achieve more than is made possible by its population, culture, and development. A critical volume may be maximal or minimal depending on subjective conditions. I would like to use here this concept of our respected scientist to say that his critical volume is considerable. He has been able to successfully surmount the subjective obstacle to his self-realization. He has realized his maximal potential as a scientist, public figure, citizen, and individual dedicating his time to his people and to the great objectives of socialism. An engineer by vocation and a specialist-scientist in training, Balevski spares no efforts or time to maintain his broad spiritual interests as well. Despite our long acquaintanceship he always amazes by recalling a historical date which we have long forgotten, or pointing out features of state and public figures whose personalities or temperament we may have somewhat forgotten, citing Goete or Heine, or whistling a melody by Chopin or Mozart. It is as though a variety of interests are clashing within him, with one group or another temporarily gaining the upper hand, thus steadily expanding and enriching the "critical volume" of his personality. I am convinced that the entire collective of the academy, whose trust he has won, values and respects his various qualities as chairman of the Bulgarian Academy of Sciences, and his efforts to serve the homeland, progress, socialism, and the ideal of humaneness in human society.

Every noted worker carries within himself, to a greater or lesser extent, something of the tragic nature of the great Don Quixote: he also fights for unreachable goals. Yet, it is precisely this tragic feature that has greatness. Angel Balevski's personality as well has such a great tragic sense, made meaningful by time. It goes together with the optimism inherent in his mind, will, and feelings. This is the optimism of the creator, the builder.

Anyone who has met Balevski and has tangibly felt the influence of his rich personality knows how this tireless optimism has been manifested--the persistence with which Balevski has pushed forward his causes, particularly that of the Bulgarian Academy of Sciences. He would know the efforts invested in keeping the Academy of Sciences in step with the times. Under his guidance, together with the collective around him, the academy was reorganized and broadened its activities to meet the needs of reality. At the present stage of considerable development of our national economy and cultural life, the academy is properly fulfilling its obligations and is always seeking ways to go forth, through thought and action.

Balevski was, and remains needed by our entire public, for he possesses the captivating qualities of an original promotor of socialism and of

humanism in our society. That is why I am convinced that our public wishes him to continue to be just as healthy, alert, and optimistic.

Allow me, as a long witness of his efforts, to wish him many more years of patient assistance in pursuing the great cause which he serves with the hopes and the optimism of the best among us.

#### BALYVARI'S CONTRIBUTIONS Praised

SOZIA STIPANIE NA BULOANBREATA AKADEMIIYA NA NAUKITE in Bulgarian No 2, 1980 pp 29,31

[Article by Corresponding Member (Yulianir Baley)]

[Text] This April Academician Angel Balevski, chairman of the Bulgarian Academy of Sciences, will be 70 years of age.

Academician A. Balevski's name is among the names of Bulgarian scientists who laid the foundations for and actively participated in the development of a contemporary Bulgarian technical science and education, and who earmarked the directions for the creation and development of our machine building industry.

Academician A. BALEVARI's personality clearly stands out against the background of our public through his great merits of learned teacher, scientist, and organizer of Bulgarian science, tireless public personality, fiery patriot, and man with a very sharp awareness of duty, morality, ethics, and civic order.

Born on 15 April 1910 in Temyan, Academician A. Balevski graduated in machine engineering, in 1934, from the Higher Technical School in Brno, Czechoslovakia. Returning to Bulgaria, he worked in the then starting Bulgarian machine building and metal processing industry in which, in addition to his other engineering activities, he participated in the creation of the first Bulgarian systems (machines) for hot pressing of malleable metals. He developed and applied a technology for steel smelting in electric arc furnaces, the production of steel ingots, and others. At that time particularly interesting among his activities were the method and device he developed for the extraction of pig iron in a rotary drum furnace. The idea of the method is to insure through a low-temperature reduction process, a sufficiently high resistance of the refractory lining of the furnace, through the good use of heat achieved by the direct contact of the fuel with the ore and, subsequently, the possibility to extract pig iron from local materials. At the start of his engineering practice, these works determined Academician A. Balevski's special interest in the field of knowledge of metals and metal technology, an area in which he subsequently developed his scientific and teaching activities.

In 1945 Academician A. Balevski was appointed professor at the then developing State Polytechnical School, where he organized the Chair on Machine Technology and Factory Organization--one of the first chairs of the Machine Engineering Department. Subsequently, it became the base for a number of new chairs which are the backbone of today's Machine-Technological Department of the Lenin VMEI [Higher Machine-Electrical Engineering Institute] in Sofia. It was here that he wrote the first textbooks on "Machine Technology," "Knowledge of Metals," and "Instrument-Making Machinery." Subsequently, on the basis of these courses a large number of technological and structural disciplines developed, studied as general-technical or specialized subjects in the various branches of our higher technical schools.

In the course of his nearly 35-year career as a scientist and teacher, Academician A. Balevski has done a tremendous amount of work in training technical cadres for our country and, as one of the creators of our higher technical education, for its development and enhancement to a modern level.

A characteristic feature of Academician A. Balevski, as a teacher, is his amazing ability to explain in a clear and accessible manner even the most complex scientific problems, for which reason he is a favorite of the students. Properly understanding the need for well-trained engineering cadres, he has devoted great concern for the development of the type of training system which provides a high level of preparedness in accordance with the achievements of contemporary science and the needs of the country.

As deputy rector of the State Polytechnical School (from 1948 to 1953) and, particularly as rector of the Lenin VMEI in Sofia (from 1966 to 1968), Academician A. Balevski contributed a great deal to the development of Bulgarian Higher Technical Education, developing with remarkable far-sightedness a number of basic concepts on the organization of the training process, the structure of the curriculum, and the content of the training programs.

Academician A. Balevski has been particularly concerned with the creation and development of new teaching cadres. He rallied around himself a considerable number of young engineers whom he trained to engage in teaching and scientific research. Most of them are already titled scientific workers--professors, docents, and scientific associates.

Academician A. Balevski's scientific research activities, which began with the very start of his work as a teacher at the chair, continued particularly intensively in the Bulgarian Academy of Sciences. In 1951 he became a corresponding member of the academy and in 1967 an academician. Here he created, first of all, the Section on Knowledge of Metals and Metal Technology of the Department of Technical Sciences which, subsequently, grew into an institute with the same name of the Scientific Trust for Basic Problems of the Technical Sciences. Closely interacting,

from the USSR, the USSR Academy of Sciences and the Academy of Sciences of the USSR, and the Bulgarian Academy of Sciences Institute of Metallurgy and Metal Technology, headed by Academician A. Balovski, represented a powerful complex for scientific research with a number of accomplishments of a high scientific level to its credit.

In the course of his many years of scientific activities, Academician A. Balovski created and developed, together with his associates, an important branch of our technical sciences: knowledge of metals and metal technology.

As a whole, Academician A. Balovski's research is focused on clarifying some basic correlations between the structure and properties of metals and the influence exerted by technological processes on the qualities of the treated metals. As a result of these studies he was able to resolve important theoretical problems, to develop new research and testing methods, and to formulate new technological processes for metal processing of great scientific and practical significance.

In one of his works, Academician A. Balovski was the first to explain some problems which had long remained unclear or on which a variety of concepts and hypotheses existed such as, for example, the experimental proof of Saint-Venant's hypothesis of maximum tangential stresses, experimental study of the temperature deformation of metals in bending stresses, twisting, or a combination of both, the proven possibility to eliminate internal stresses in all bodies through vibration, determination of criteria for the occurrence of cast irons in thermal shock, and others. His studies on the correlation between stresses and deformations in the technological area of stretching and pressing irons made of pig iron are of considerable interest. This makes it possible to rapidly and accurately resolve problems related to determining the size of stresses and deformations in various stress conditions, the development of methods and machines for testing metal fatigue in combined stress, studies of the ability of metals to dampen vibrations, and others.

Throughout his scientific work Academician A. Balovski has made a considerable contribution to problems of applied knowledge of metals and, particularly, knowledge of metals of gray cast irons and certain aluminum alloys.

A large number of the results of such studies were used later by Academician A. Balovski's associates and students in the development of a number of new problems and tasks related to the technological strength of metals in bending, surface chemical-thermal processing of steels, high-speed plastic deformation, structure forming in shape castings, and others.

The method for casting with gas counterpressure, developed by Academician A. Balovski and Corresponding Member Yu. Rimov is a considerable contribution to technology. This method, a novelty in the world's casting

technology, has already found considerable practical use and makes it possible to produce castings with great precision and high mechanical qualities. At the same time, it creates new conditions for the processing of metal smeltings with gases. This offers great practical possibilities for the production of new alloys.

The studies made so far by Academician A. Balevski and his associates related to the method of casting with gas counterpressure, carried out by the Bulgarian Academy of Sciences Institute of Knowledge of Metals and Metal Technology, revealed and clarified a number of new phenomena related to the influence of counterpressure on the movement of the metal stocks and the filling of the casting mold, the interaction between the metal and the gaseous phase and the walls of the mold, the infiltration of the liquid metal during the crystallization of the casting, and others. These are original contributions to casting theory. A large number of design problems related to the production of machines and equipment for counterpressure casting were clarified and given original solutions.

All these achievements triggered not only great interest and met with a broad response domestically and in foreign literature, but opened new directions for further studies and developments of interest both from the theoretical and practical viewpoints, to be pursued in the future.

Thus, under Academician A. Balevski's guidance, a school of scientific workers was trained in Bulgaria, developing his basic ideas and accomplishments in some directions of the knowledge of metals and metal technology in areas which could be combined within one major direction: the creation of new highly effective materials and technologies for the study of the behavior of metals processed according to such technologies.

Thus, Academician A. Balevski's personal contributions as the scientist and researcher are a major scientific work of which our country can deservedly be proud. The great scientific erudition, broad culture, and organizational talent of Academician A. Balevski were particularly clearly manifested in his activities as the head and organizer of science in our country, following his election as Bulgarian Academy of Sciences chairman, in 1968. According to the place and role of the academy, not only as a center for the coordination of scientific research in our country, but as a center which should insure the further development of science and technical progress, and enhance the standards and social awareness of our people in accordance with the requirements of the developed socialist society, he has made a substantial contribution to the proper and systematic implementation of the policy of the party and the state in the fields of science and technical progress, in enhancing the role of the Bulgarian Academy of Sciences as the highest comprehensive scientific institution in the country, broadening its international relations and, particularly, intensifying its cooperation with the USSR Academy of Sciences. Academician A. Balevski ascribes particular importance in the activities of the Bulgarian Academy of Sciences to

basic science, its research main purpose is to raise the level of science and enhance the scientific potential of our country. At the same time, however, he notes that it is likewise the need for applied research and the usefulness of the applications of scientific developments in industry. Along with concern for the development of such activities by the corresponding Bulgarian Academy of Sciences institutes, it considers as a main task in its activities the work it must carry out for the spiritual enrichment of our people and for maintaining an active Bulgarian awareness for the sake of internationalism.

Characteristic features of Academician A. Balevski as a man and a scientist are his high moral and ethical standards, his great concern for the useful and humane utilization of scientific accomplishments, and his great love for people. He is the author of a number of studies, articles, pamphlets, and other publications on various problems of scientific organization and methodology, education, the ethics of scientists and their role and responsibility for the preservation and consolidation of the peace, disarmament, problems of international scientific cooperation, and others.

Academician A. Balevski is an active state and public figure. He is a member of the BCP Central Committee (since 1966), a people's representative for Pleven and Pleven Okrug, member of the State Council of the Bulgarian People's Republic (since 1971), deputy chairman of the Presidium of the Union of Scientific Workers in Bulgarian, chairman of the Bulgarian-Czechoslovak Friendship Society, member of the scientific councils of several scientific research institutes, editor in chief of the periodical *TEKHNICHESKA MISHUL*, and others.

Academician A. Balevski has received high state awards and honorary titles for his scientific, teaching, and public work. He is the bearer of the Order of G. Dimitrov (1970, 1973), Red Labor Banner (1959), Kiril i Metodiy Second Class (1957) and First Class (1963), and the honorary titles of Hero of Socialist Labor (1973), People's Worker in Science (1971), Honored Worker in Science (1966), and twice laureate of the Dimitrov Prize (Second Class, 1951; First Class 1969).

His activities have been recognized by a number of international scientific and other institutions. Academician A. Balevski is a foreign member of the USSR Academy of Sciences (1971), honorary member of the Bulgarian Academy of Sciences (1970), and the Polish Academy of Sciences (1971). He is a foreign member of the Czechoslovak Academy of Sciences (1973), foreign member of the Academy of Sciences of the GDR (1974), honorary doctor of the Polytechnical School in Ilmenau, GDR (1973), member of the Academies of the Mongolian People's Republic (1974), and foreign member of the Athenian Academy (1973). Academician A. Balevski is a member of the Permanent International Committee of the Pugwash Movement of Scientists (1971) and member of the Polish Society of Theoretical and Applied Mechanics. Furthermore, he is the bearer of the gold medal Mikhail Lomonosov (1973) of the USSR Academy of Sciences Presidium, the

gold medal of the French Society for the Encouragement of Scientific Research and Inventions (1970), the gold jubilee medal of the Academy of Sciences of the Republic of Cuba (1972), the special Polish medal N. Kopernik, the GDR Order of the Star of Friendship Among the Peoples, gold (1978) for contributions to the development of mutual understanding among nations and strengthening the peace, the gold medal For Contributions to Science and Mankind (1979) of the Czechoslovakian Academy of Sciences, the highest class of the French Order of Academic Palm (1979), and other foreign orders.

Through his tireless activities Academician A. Balevski has made a lasting mark not only as a noted Bulgarian scientist and long-term head of the Bulgarian Academy of Sciences, and not only as one of the creators of the Bulgarian Higher Technical Education and Contemporary Machine Building Industry, but also as a noted public personality with extensive social recognition in our country and far beyond it.

On the day of his 70th birthday we greet the scientist, social figure and man Angel Balevski wishing him with all our hearts many more years of good health, high spirits, and new creative successes in his useful and responsible activities for the advancement of Bulgarian science and the good of our homeland.

5003

CSO: 2202

## REPORTS ON SCIENTIFIC ACHIEVEMENTS, NEW TECHNOLOGIES

ЗЕЛНА СПИСАНИЕ НА БУЛГАРСКАТА АКАДЕМИЯ НА НАУКИТЕ in Bulgarian No. 2, 1980 pp. 79-82

[Report: "Proposals on the Application of, and Report on Applied New Instruments, Materials, and Technologies"]

[Text] Laser With CuBr Vapors

At the present stage of development of laser physics and technology, the proper vapors laser is among the most effective, radiating in the visible range of the spectrum. A major problem related to the use of this laser is the requirement to maintain relatively high temperatures (over  $1,500^{\circ}\text{C}$ ) in the active laser medium in order to insure the optimal concentration of copper atoms. Of late active studies have been underway to develop low temperature active media based on some copper alloys.

For the first time the IFTT [Solid State Physics Institute] of the Bulgarian Academy of Sciences has developed such a laser, using the vapors of CuBr in which the necessary concentration of copper atoms is obtained as the result of the electronic dissociation of CuBr molecules at a temperature of the active environment of about  $400^{\circ}\text{C}$ . This way the working temperatures of the copper laser may be lowered by  $1,100^{\circ}\text{C}$  compared with the laser using pure copper vapors. This solution considerably simplifies the structure of the laser and offers greater possibilities for its use as part of a variety of laser instruments.

The laser generates wave lengths of 510.6 nm and 576.2 nm with an overall average initial power ranging from 0.5 to 10 watts, based on the dimensions of the active environment. It works on a pulse system with a pulse frequency of 15 kilohertz.

The laser has been recognized as an invention and an authorship certificate has been issued to the collective consisting of Scientific Associate Nikola Subotinov, Scientific Associate Petur Telbizov, and Physicist Stoyan Kalchev.

Currently studies are underway to improve the laser's reliability. The purpose is to create a stable and long-lasting laser source which could be used outside the laboratory. Following the completion of the studies the laser will be submitted for application by the Scientific Research Institute of Special Optics of the Metalkhim DSO [State Economic Trust].

The laser may be applied in the development of laser locators and telemeters. It is a convenient source for air and water transportation navigation. With a power in excess of four watts the laser ray may be used in medicine as a bloodless scalpel. The high intensification coefficient in active medium of the copper laser makes its utilization possible in the development of a laser microscope. The laser may be applied in scientific research in physics, chemistry, biology, and others.

#### X-ray Methods for the Study of Textures and Substructures

The cold rolled sheet of low carbon steels is extensively applied in a variety of economic sectors as a construction material.

The Plant for Cold Rolled Low Carbon Steel Sheets of the Kremikovtsi Metallurgical Combine began regular production in 1972. This faced the scientific workers with new tasks related to the development of highly sensitive and selective capacity methods for the study of cold rolled sheets and the development of suitable models for the technological stages in such production.

Together with the chair of solid state physics of the Kliment Okhridski Sofia University, the low temperatures sector of the IFTT developed and applied at the Kremikovtsi Economic Metallurgical Combine X-ray Laboratory, x-ray methods for the study of textures and substructures in different texture components of cold rolled low carbon steel. By modeling the conditions of the recrystallizing heating of the cold rolled sheet of 08 kp low-carbon boiling steel, and studying changes in the structure and texture of the substructural level, the following original scientific conclusions were reached:

- The recrystallizing of the cold rolled 08 kp steel sheet is considered by the breakdown of the solid carbon solution into  $\alpha$ -iron;
- The separation into phases is heterogenous in the individual textural components, leading to obstructions in the development of the component  $\{111\}$  suitable for standing;
- As a result of the different speed of restoration processes and the breakdown of the solid solution by changing the speed of heating to the temperature level of isothermal temperature stagnation of 700°C the extent of the breakdown, recovery, and recrystallization may be controlled: an increase in the heating speed lowers the number of individual phases preceding the recrystallization, which stimulates the development of the textural component  $\{111\}$ .

On the basis of the obtained results a scientifically substantiated proposal was submitted for experimentation and application at the Kremikovets Metallurgical Combine of an improved system for recrystallization heating, consisting of fast heating to 700°C with the elimination of the breaking platform at 550°C. The proposal is radically different from the technology used so far in heating cold rolled 08 kp steel sheets which calls for a slow heating to a 500-600°C temperature, retaining this temperature for 8 to 12 hours, and heating to the 700°C level with a delay of 15-20 hours, based on the weight of the coil. The planned saving from this development in 1980, resulting from the shortening of production time and improving the mechanical properties of the sheet, is 237,450 leva.

#### Applied Developments of the Electronics Institute

In recent years a number of results of studies conducted by the Electronics Institute have been applied in industry or in scientific research. Following are some new examples of the utilization of results.

In 1979, on the basis of existing physical concepts of the interaction between powerful electric beams and matter, and original experimental research, a selection was substantiated of a suitable model for the mathematical description of the process of part welding with an electron ray. The analytical formulas obtained were used for obtaining, with the help of computers, of nomograms for determining the system of electron ray welding of thin-walled parts. The use of these results at the Impuls Plant in Gabrovo save 157,000 leva in 1979 and expected 1980 savings will exceed 400,000 leva.

Based on an invention authorship certificate to meet the requirements of the Bratya Chengelievi Plant in Aytos, an instrument for the automatic measuring and grading of resistors was developed and mounted in the technological lines of the plant. Its use raises the level of accuracy of the produced resistors. Such equipment is being developed for measuring and grading quartz resonators produced at the ZEPE [Electric Porcelain Products Plant] in Sofia. The developed method for the automatic measurement of the deviation of a given value from a specific nominal value will be applied in other production processes as well.

The improved technology developed for the manufacturing of selectively transparent iron oxide photographic shields with direct current jet pulverization has replaced the technology so far used at the ZPP [Semiconductors Plant] in Botevgrad. The photographic shields developed in accordance with the new technology are more resistant, have improved optical characteristic, and low defect density. The productivity of the process has been substantially increased as well, thus substantially reducing the cost of the photographic shields compared with same quality products offered by foreign firms. This development is protected by two authorship invention certificates.

Also protected by authorship certificates is the created general purpose solid state laser system for purposes of emission spectral analysis which increases the possibilities of the MA-1 Zeiss-Jena system. The general purpose solid state laser system has been applied at the Optics and Spectroscopy chair of the physics department of the Kl. Okhridski Sofia University. A modification of the system is being applied at the Central Regeneration Laboratory of the Bulgarian Academy of Sciences.

#### Izaplan Planetary Wire Feeding Systems

The institute of technical cybernetics and robotics is working on the basis of the comprehensive program "Study and Development of Planetary Wire Feeding Systems for the Mechanization and Robot Operations of Welding Processes."

In accordance with this program a group of authors, headed by Senior Scientific Associate D. Samokovliyski and Senior Scientific Associate A. Angelov, developed a method and series of planetary wire feeding systems, popularly known as Izaplan. A total of 120 patent requests have been submitted abroad and 46 patents have been received. In 1979 alone, foreign exchange totaling 5,272,000 leva was earned from the export of wire feeding systems to the socialist and non-socialist countries; in the same year savings totaled 3,450,000 leva.

The latest invention within this series is a "system for the wire feeding at large distances," a patent for which has been requested in 24 countries. It is an improvement of the second and third generation Izaplan systems used for the planetary feeding of electrode wire in MIG-MAG protective environment for electric arc welding. In particular, the invention applies to the automatic control of the speed with which the electrode wire is fed to at least two consecutively linked wire-feeding mechanisms included in the system. The correlation between the mechanical resistance and the electric load is taken into consideration. A steady speed of the wire feeding is insured. The shifting of the electrode wire and its deformation are avoided. The structure of the systems used so far is simplified and their operational reliability is improved.

The invention is applicable in robot welding systems should it become necessary to feed electrode wire from the source of the wire to a low capacity manipulator with high maneuverability. Furthermore, it could be applied in mass welding production, particularly in welding large-sized items and aluminum structures.

The Institute of Technical Cybernetics and Robotics is developing items which include this invention within a block of several inventions. Their series production will be undertaken at the Optikoelektron Metallurgical Combine in Panagyurishte this year, as a mass produced item for MIG-MAG welding equipment and, in 1981, as an addition to robot systems.

At the beginning of 1980 a license contract was signed with a U.S. company which stipulates, in addition to the granting of a license for the production of such items in the United States, the export of Bulgarian goods to that country. On the basis of requests received from different countries, earnings from exports of the new wire feeding systems will total several million leva mainly in capitalist currency.

#### Absorption System for Hydrogen Sulfide for an Installation for the Regeneration of Waste Gases

On the basis of the new highly effective designs of mass-exchange apparatus, developed at the TsIATIMET, an absorption system was developed for tapping hydrogen sulfide from industrial waste gases. The planned and used system can process 300,000 normal cubic meters of gas per hour. It virtually eliminates the hydrogen sulfide contained in this gas, thus making possible the further treatment of the gas with a view to extracting the carbon bisulfide it contains. This returns to the production process considerable quantities of sodium sulfide and creates possibilities for obtaining additional amounts of carbon bisulfide and eliminates toxic substances from waste gases.

The development is on the highest world standard. The size of the equipment is one-third of that of similar absorbers designed by foreign (western) companies and having the same efficiency. Seven absorption columns with Raschig rings in the Khimproekt design have been replaced by two systems with a new original charging.

Savings from the utilization of the system, regularly produced by the Svilena Economic Chemical Combine in Svishtov, as of April 1979, will total 1,268,000 leva as per the documents submitted by the consumer. The development includes several authorship certificates and may be applied at other similar industrial sites.

SVS1

ESD: 1/82

## SUCCESS WITH EARLY ANIMAL EMBRYO TRANSPLANT REPORTED

## Transplant Methods, Experiences

Bratislava HLAS LUDU in Slovak 16 Apr 80 p 3

[Article by Lucia Zuberova and Karol Fisera: "Transplant of Early Embryos"]

[Text] Geneticists are penetrating ever deeper into the mysteries of life, and are acquiring more precise knowledge of the laws of nature. Much of what until recently had been unknown, indeed unimaginable, has today become reality. A good illustration of this is the success achieved by the Research Institute of Animal Production [VUZV] in Nitra. One of its most important areas of research is early embryo transplant in farm animals which, in effect, means fertilization of eggs in one female and their transplant and incubation in another. This opens up a new perspective for better and faster breeding of farm animals, as well as for a higher birth rate.

This year the VUZV, which closely cooperates with other research institutes within CEMA, will celebrate its 30th anniversary. The new building on the edge of town, houses several departments: bovine breeding, sow breeding, genetics and experimental biology, and others.

We first went to see the director of the institute, Prof Jan Plesnik, and staffers Pavol Majerciak and Milan Tomanek. In his introductory remarks, the latter told us: "Research in early embryo transplant represents a new stage in animal production. This is the most modern method in biology currently being perfected all over the world, and this country has also achieved remarkable results in it. Animal transplant permits a more intensive utilization of the genetic potential of farm animal females. Following initial successful experiments resulting in healthy offspring in sows, we have arrived--in cooperation with research institutes of CEMA countries--at transplant of early embryos in heifers. The aim of these transplants is especially the production of twins. With sows, the transplant is intended to accelerate genetic progress by using early embryos from genetically qualified sows."

## Constructive Cooperation

Initial experiments were performed at the turn of the seventies and the first actual trials 4 years later. We had to resolve complicated problems in going from theoretical models, through concrete experimentation, all the way to practical testing. In the preparatory work of experimentation and its laboratory testing we had the participation of leading scientists from the USSR, GDR, Poland, Hungary, Bulgaria, and Romania. Our own scientific institutions also share in the successes, notably the VFZV in Nitra, Institute of Animal Physiology of the Czechoslovak Academy of Sciences in Libechov, and the Research Institute of Veterinary Medicine in Brno. Many scientists and specialists took part in joint experimentation, in order to acquire the widest possible experience. It has become a tradition that in joint experimentation Soviet, German, Polish, Hungarian, and our own scientists meet to exchange experiences and search for new approaches. Cooperation has yet another form, namely, all of the participating countries share in providing the complicated laboratory technology.

In the course of a few short years, there have emerged among members of this broadly-based international collective not only professional, but also deeply human, almost family, relations. "We all gain from this joint effort," comments Professor Plesnik, "each of us personally, but also the whole collective and our institute."

## Transplants in Bovine Cattle

Transplants have already produced initial partial successes. We have found that, with assistance, it is possible to "produce" especially twins. The method of transplant is linked to the timing of the reproductive cycle of the "donors" and "receivers." Both must be at the same stage. In the donors, there is induced superovulation, i.e., hormone stimulation of growth of the reproductive cells in the ovaries.

This method of obtaining embryos is the most effective to date. Heifers which have not yet borne calves are used for the most part. Superovulation, i.e., hormone treatment, however, still remains the principal problem, even though the portion of embryos obtained by this method is 40 to 60 percent. Scientists cannot yet determine with certainty how many eggs will be prepared in the cow's body and how many of these will be usable.

"Early embryos are obtained by both surgical and nonsurgical methods," says Comrade Tomanek. "In this manner, the animals can be used more than once. For the time being, we favor the surgical method almost exclusively in our institute. The operation lasts less than an hour. The results with surgical transplants are good and guarantee success of 60 to 70 percent. The eggs which we obtain are placed in a prepared laboratory bank in a propitious environment where they can be examined under a stereomicroscope. The usable embryos are transplanted into the "receiver" 7 to 8 days after impregnation in cows, and 3 to 4 days after impregnation in sows. These are the optimum

intervals. When we have more eggs than cows ready to receive, we "store" the eggs by means of deep-freezing. Other embryos, especially those of cows, can be preserved, in a thermostat under optimum temperature of 37 degrees Celsius, by cultivation under glass until transplant is performed within a period of 24 to 72 hours."

The institute has a new machine for programmable deep-freezing of early embryos. This means that the embryos can be stored even longer under minus 196 degrees Celsius in liquid nitrogen. This method has already been tested in practice with bovines. This procedure is of great importance and has realistic prospects for practical application. Results already obtained indicate the possibility of broad utilization of this method in the future.

Indeed, we can already see in the VUZV healthy and robust young pigs born from transplanted embryos in the body of an alien mother, and calves born from embryos which, following a two-year deep-freeze, were brought to life in containers from the Zootechnical Institute in Krakov. Also running around in the institute compound are small calves born from embryos transported in the uterus of a live rabbit from the Institute of the Czechoslovak Academy of Sciences in Liberehov near Melnik. As Comrade Tomanek reported to us, they are doing very well. Research institutes of countries participating in this program are exchanging embryos.

#### Possible Determination of Sex

With respect to embryo transplant, the question of choice of sex becomes topical. Transplants with predetermined sex is thus another area of research in the VUZV. Even before the transplant, scientists are able to identify the sex of each embryo. This is possible on the basis of sexual chromosomes. When this method is perfected, it will certainly have great significance in practical application.

In VUZV last year achieved a record of as much as 70 percent twins in embryo transplants. For its work in this area the VUZV was awarded the Golden Side prize at the Agrokomplex 79 exhibit where samples of this process were shown.

In conclusion, Comrade Majerciak told us: "Our research on early embryo transplant will, beginning with 1982, be based on the results of transplant methods of selected enterprises, and we will also monitor and utilize new approaches and discoveries of the International Scientific Collective in nonsurgical methods of transplant.

Embryo transplant in bovine animals will in the future certainly be an important factor in breeding. However, it is necessary to resolve certain problems for, as in any new discovery, there are still certain imperfections. Every road to victory is paved with obstacles.



Cow with piebald in the  
VUTV in Nitra



Calves from French selection

#### [Transplant Utilization, Prospects]

Tržan NAS (Hof in Czech No 4, Apr 80 supplement pp. 5, 8, 10) (V. ČERNÝ)  
[Research Institute of Animal Production in Nitra]

[Article by Pavel Majercák, Jura Fieko, and Milan Jemalák, VUTV in Nitra  
"Results of and Outlook for Practical Utilization of Early Embryo Transplants  
in Farm Animals"]

[1984] Development of natural sciences in recent years has enabled us to  
apply our knowledge even to the reproduction process of farm animals, and  
thus accelerate the targeted breeding program and achievement of zootechnical  
aims. In the area of reproduction, biotechnology includes procedures of  
targeted engineering of the physiological and reproductive processes with the  
aim of improving its usefulness and increasing it by regulating the time  
cycles of sexual functions in animals. Purposeful influencing and the  
possibility of regulating the reproductive process has great potential  
impact on the industrial forms of animal mass production.

Among methods to increase the birth rate in heifers and sows we include:  
besides insemination, stimulation and synchronization of rutting and regula-  
tion, transplant of fertilized eggs, early symptoms of pregnancy, and  
induced and synchronized births. A key role during the past year in the  
area of reproduction, was played by insemination which permits the  
application of an effective breeding and hybridization program.

Of the modern methods in reproduction, we are today beginning to develop  
group synchronization of rutting in large-capacity installations with the  
over organization of reproduction, synchronization of big births and  
reproduction of oviduct thereafter.

Such intervention in the internal processes of animals was made possible only by external hormone support of physiological functions and substitution of undesirable hormones in a given stage of the sexual cycle.

We can say that by the application of effective substances we can intentionally adjust the reproductive functions and increase sexual intensity in animals.

Today transplant of early embryos represents the meshing together of all the above-mentioned methods, especially in beef cattle and sows. Since the use of this method requires the resolution of complicated problems ranging from the theoretical foundations through actual experimentation all the way to practical application--and since research and testing related to this work is financially demanding--scientists of the CEMA countries joined together in an international collective with the goal of finding an effective method of transplant suitable to conditions of mass production.

This collective has now worked intensively for about 4 years, during which time it has engaged in a series of experiments, the results of which produced a number of theoretical, as well as practical findings. The work is organized so that each research participant of the collective deals with clearly-delineated aspects of the problem (cultivation of embryos, synchronization and superovulation, evaluation of embryos, technology of operation, deep-freezing of embryos, radio-immunological methods, etc.), but simultaneously each participant shares the findings in his specialty with the others, so that each participant is able to implement the transplant method in its entirety.

Based on results in our own institute, we can confirm the effect of this international cooperation which has enabled us to achieve a successful transplant of early embryos in sows with offspring, surgical transplants of early embryos in sows with offspring, and impregnation of heifers with transplant of deep-frozen early embryos.

Our institute devotes itself mainly to the problem of obtaining and transplanting early embryos with the aim of producing twins in heifers. We are perfecting various procedures of hormone treatment for the animals, we examine the problems of synchronization of rutting, superovulation, cultivation, deep-freezing, but also the techniques of surgical and nonsurgical transplants. The goal is to find technologically less demanding and economically less costly procedures.

We have tested various hormonal substances for stimulating ovary functions, while evaluating their superovulation effectiveness, and we are seeking new ways to improve the very variable effects of gonadotropines. So far, however, application of gonadotropines (FSH, PMS, PMSG, LH) of our, as well as foreign provenance, have not produced the expected results.

Nevertheless, superovulation remains today the only viable method of stimulating ovary functions to produce a satisfactory number of fertilized, life-sustaining eggs.

The process of synchronization of the rutting cycle became simpler and more effective by the discovery of F 2 alfa prostaglandines. These are very effective in synchronizing the sexual cycle of both donors and receivers.

Obtaining and transplanting early embryos is accomplished surgically by a cut in the linea alba. The work is more demanding on the people performing this operation, but the access to the reproductive organs is easy and without traumatic effects. Assuming that we apply one blastocyst in each corner of the womb, this approach has advantages over a cut in a standing animal.

Surgical transplant of two early embryos with the aim of producing twins has produced results which are promising and confirm the thesis that the receiver did not need to have two yellow corpora lutea to bear twins.

Usable optimum methods of transplant of early embryos in sows demands, as in bovine cattle, the mastering of the superovulation process and its ability to be repeated, synchronization of the reproductive cycle and timing of impregnation, simple and safe methods of obtaining and application of early embryos, their ripening and cultivation in conditions under glass, and long- and short-term storage. At the institute we use young sows as biological material and we have succeeded in superovulation and timed impregnation by the use of gonadotropine hormones PMSC and HCG. The response to hormonal stimulation, however, is variable. Actual transplants are performed surgically by a cut in the linea alba or from the side. We implant 5 to 6 early embryos into each corner of the womb at the stage of 4 to 6 blastomeres.

Cultivation under glass permits us to study the physiology of early embryos in a controlled environment of cultivation medium, which is necessary for the needs of storage and transport. The environmental requirements for an early embryo for 3 to 5 days after fertilization, are relatively simple. As our results show, early embryos in sows at the 4-blastomere stage can be kept under glass for 24 to 72 hours and should be implanted during this period. These findings have not only scientific significance, but breeding and economic impact as well.

From 1975 to 1978 the international collective worked on perfecting the surgical methods of transplant. From 1979 to 1982 there will be emphasis on research in nonsurgical methods.

The introduction of transplant in cattle offers specifically the following advantages:

- more intensive increase in the number of high-utility animals, bearers of young bulls,
- shortening of the generation interval (no pregnancy period in the donors, obtaining eggs from prepuberty heifers),
- increase in the production of twins,

--possibility of producing heifers for meat production from cows intended primarily for milk production,

--transplant of early embryos after a deep-freeze period,

--export and import of early embryos instead of live breeding animals, with respect to expense and adaptation to new climatic conditions,

--early determination of sex,

--opportunity to influence genetic characteristics by means of the so-called micro-manipulation (adding hereditary characteristics to the embryo from more than two parents).

In sows, we are concerned especially with acceleration of genetic progress by requiring highly positive assessment of the donor with respect to meat yield and fodder conversion, and we are transplanting only embryos with such desirable hereditary characteristics to the receivers.

To date, we have performed 26 transplants at the Nitra VUZV, in which we used 43 donors. Surgical transplant was performed in 18 heifers, nonsurgical in 8 heifers. We have obtained 67 early embryos of which 45 (67 percent) were suitable for transplant. Twenty-two calves were hatched (85 percent). Following surgical transplant, 9 sets of twins were hatched from 18 transplants with this goal (50 percent). We performed 5 transplants with the use of deep-frozen embryos.

Recent experiments in cooperation with the Institute of Physiology and Genetics of the Czechoslovak Academy of Sciences in Libechov, and the Institute of Zootechnology in Krakow, attest to the benefits of scientific integration, and to the realistic perspective of practical application of transplants. In June 1979 at the VUZV, 8 experimental heifers of the black-piebald breed were impregnated with transplant of 16 early embryos which had been under cultivation for 24 to 48 hours. The embryos came from superovulated heifers at the Libechov institute and were brought to Nitra by car in the uterus of a live rabbit. Five twins of heifers were born, of which 5 were males and 5 were females.

During the same period, two experimental heifers were impregnated after having received 4 deep-frozen early embryos brought in a container from the Institute of Zootechnology in Krakow. Two pair of twins were born, consisting of one heifer and three bulls. The transplant achieved 70 percent of multiple fetus. In October 1979 this interesting experiment was repeated, in cooperation with the Libechov institute, in that we transplanted into 15 heifer receivers 30 early embryos obtained from superovulated heifers or cows. The embryos were cultivated in the VUZV after 24 to 48 hours in the uterus of a rabbit.

The transplant of early embryos in sows is more complicated in the relationship between superovulation and the vitality of the eggs. In May 1979, in

cooperation with the Research Center for Animal Production in Dummerndorf, we experimented with superovulation, cultivation, and transplant of early embryos. Following transplant into 7 receivers, 3 sow embryos were left.

Our current role is to reproduce these accumulated findings and modify them so that they can be used in coming years for application under specialized conditions in the enterprises. For this reason the Scientific Production Association for Breeding and Cultivation of Farm Animals in the Slovak Socialist Republic established late last year a working collective for early animal transplant, so that the exchange of experiences might be accelerated. The collective includes workers from the State Breeding Enterprises, State Veterinary Administration, and Agrokomplex, as future implementors in practical use of the transplant method.

The long-range task is to master the problem of establishing a bank of deep-frozen embryos. Today the international collective is still directing its attention to perfecting nonsurgical methods of transplants.

9496

CSO: 2402

## METHODS TO DETERMINE PRODUCTION FACTORS INFLUENCING BIOLOGICAL VALUE OF MEAT

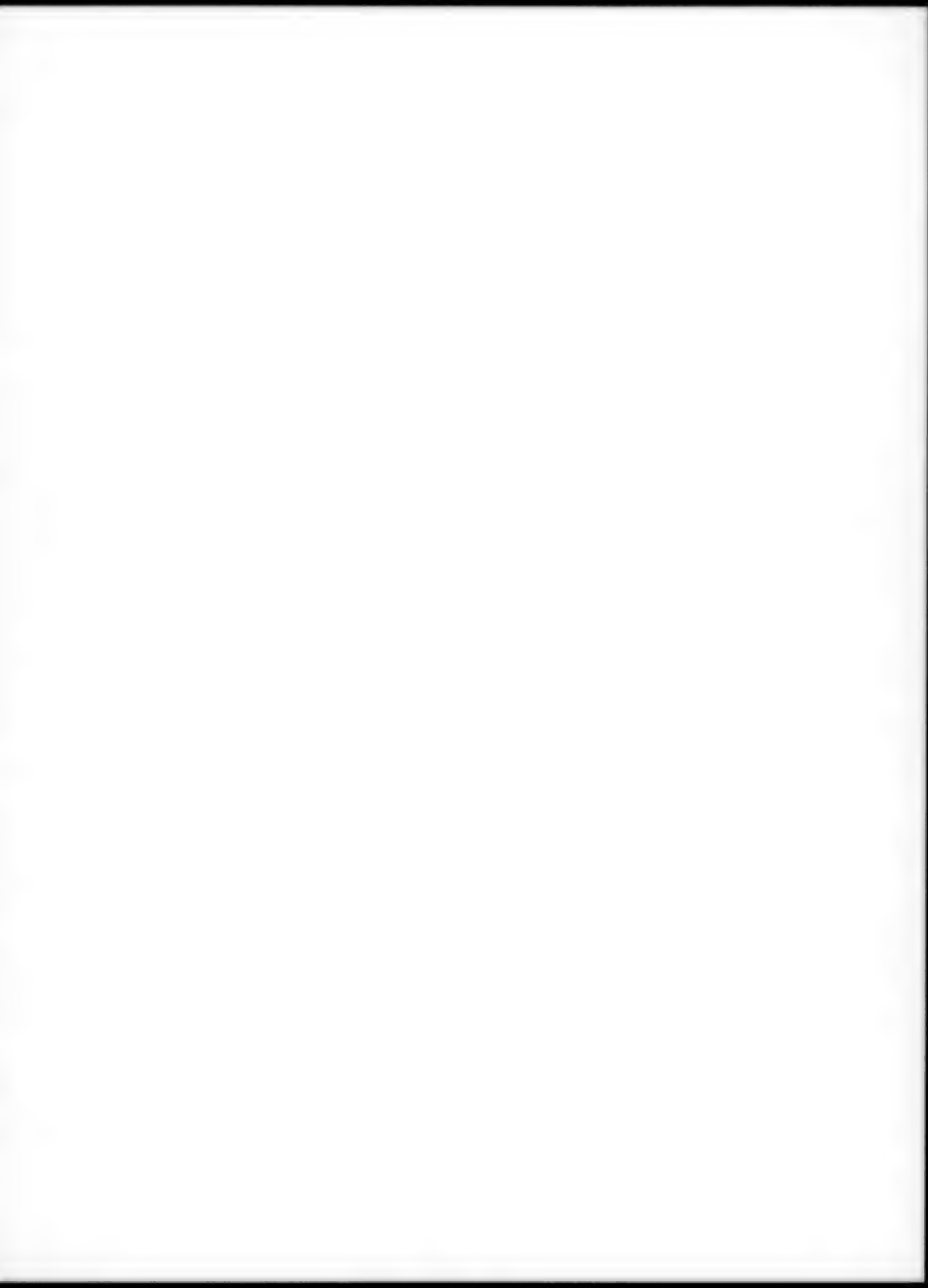
Budapest MAGYAR ALLATORVOSOK LAPJA in Hungarian Vol 35 No 3, Mar 80  
pp 185-186

DOBES, Miroslav, Dr., docent, Veterinary Medical Academy, Brno, Czechoslovakia

[Abstract] With the decrease in the amount of slaughter animals rejected for health reasons, attention is focussed on the biological value of meat. The nutritional table recommended in the CSSR for humans is presented. At the Meat Industrial Research Institute in Brno, a complex testing method was introduced to detect changes in the biological value of meat. It involves metabolic tests--blood and urine analyses including pH, acid-base balance, enzymes, vitamin A, glucose, urea, ketone bodies, lactate, minerals (Na, K, Ca, P, Mg and Fe), hemoglobin, differential blood count, etc. Tests for the technological utility value of meat include: gross and net weight before slaughter, weight of meat after slaughter, fat tissue around the kidneys, weight of kidneys, head, tongue, lungs, heart, liver, spleen and skin, weight of cut meat after cooling, meat pH on the surface and inside, dry matter and fat in certain muscles, water-binding capacity of meat, glycogen content, color, ammonia content, taste after heat treatment and curing, etc. Tests on the biological value of meat and for detection of foreign matters have been developed at the departments of food hygiene and technology, physics, chemistry, and biochemistry; these tests are also listed. The results are computerized. It was shown that the method as a whole or in part can be used to detect the effects of new technologies on the biological value of meat. No references

2473

CSO: 2502



POSSIBILITIES OF GENETIC ENGINEERING DISCUSSED

East Berlin NEUES DEUTSCHLAND in German 26-27 Apr 80 p 12

[Article by Michael Strauss, Virology Department, Central Institute for Molecular Biology, GDR Academy of Sciences: "Interference With the Life Plan?"]

[Text] Genetic engineering is a methodic discipline of molecular biology, whose object is the detailed molecular analysis and the intentional new combination of heredity units. The possibilities and limits of this still young discipline are discussed in this article.

The heredity units of microorganisms and higher beings, designated individually as genes and as a whole (in the cell nucleus) as genome, have during the past 10 years been detected and analysed by novel molecular biology techniques.

A range of methods known as gene technology now permits the isolation in pure form of individual genes from the total genome of an organism. They can be changed if necessary in a certain way by biochemical methods, and introduced into another organism. Since the application of gene technology really concerns technical and construction work with biochemical tools and the blueprints of life, we talk of genetic engineering.

Nowadays two different actual fields of application are distinguished. On the one hand, isolated genes would make it possible to analyze as molecular probes changes in the genome of an organism. By their means it is possible to diagnose some human heredity diseases (sickle cell anemia, Cooley's anemia). According to the latest data it is also possible to diagnose certain tumor cells.

Molecular Probes

On the other hand, isolated genes could also be introduced into another organism or in their cells and become active there. In this manner, in recent years, a medically and economically significant area has been opened

up, especially in the United States: microbial mass production of gene products of higher organisms. For example, this is the means of production of animal and human hormones, such as insulin and somatostatin, already on a technical scale in bacteria cultures. Furthermore, the production of vaccines by means of bacteria, in which hereditary information has been introduced by viruses, is assuming increasing importance

But for the moment both the aspects mentioned are still applied internationally predominantly to obtain basic data on the structure and the function of the genetic material. Gene technology is used, among other things, for some of the areas mentioned both in our institute and in two other institutes of molecular biology of the GDR Academy of Sciences.

### Actual Possibilities

Another possible area of application of gene technology has been for years the object of more or less speculative discussions: gene therapy for hereditary diseases in man (designated in part also as gene surgery).

According to the international statistics, about 5 percent of the children in the world today are born with a genetic defect. Of the more than 1,500 various known hereditary defects, many of them can be attributed to complex changes in the genome, whose occurrence therefore involves one or several genes. Only about 10 percent of the genetic diseases are due to metabolic defects, due to a structural change (mutation) in a gene, which is responsible for the supply of an enzyme needed for the metabolism. This would be the only group basically accessible to gene therapy. Gene therapy for the entire organism hardly seems possible, since to this end, each individual cell would have to be "treated." But more realistic possibilities are offered for the treatment of diseases in which the defect acts only on certain organs.

In the case of some metabolic defects it is possible to prevent the occurrence of the disease, insofar as it had been detected early in the screening test of the newborn baby. This includes the Guthrie phenyl ketonuria test carried out in the GDR for all newborn infants. The symptoms of the disease can be prevented with a suitable diet.

About 100 metabolic defects can be established in embryonal cells by antenatal diagnosis. They can be obtained by amniocentesis. If a defect is detected, the mother is generally advised to terminate the pregnancy.

The hereditary units (genes) of all organisms are anchored in the same manner in a regulated blueprint of the DNA (desoxyribonucleic acid). The genetic data locked up in the DNA is transferred by a structurally very similar single-stranded messenger RNA and translated subsequently into the definite sequence of aminoacids of a protein. According to the classical representation, each DNA area, coding a certain protein, is known as gene. Precise information as to where the individual genes are located were only available

in the last 10 years. It became possible to assign to the various individual genes a specific area within its chromosome. It seems now only a question of work time for all known gene products to be assigned a corresponding DNA section on a certain chromosome.

### Gene Mapping

The possibility of transferring genes between cells of different animal species, has been applied on a routine basis for some years for gene mapping. Complete chromosomes of one animal species are introduced into cells of another or of the same type, and are able to compensate therefor certain genetic defects. But this method does not seem specific enough for a gene therapy, since for a directed selection in the best of cases it is only possible to isolate one cell out of 10,000, integrating the desired gene in a stable manner. This frequency would be much too low when applied to the whole organism. The relatively few restored cells could not prevail.

Using gene technology methods last year it was for the first time possible in the United States to transfer isolated animal genes into other animal cells, using the DNA of a virus as molecular vehicle. We are also working with the virus concerned (Simian virus 40) and believe that this method is also very far from allowing gene therapy in man.

### Difference of Opinions

At the VII Kuhlungsborn Symposium held in November 1979 on the subject "Genetic Engineering and Man," the molecular geneticists and philosophers of the GDR studied jointly the problem of possible interferences in human heredity. The almost uniform opinion was that gene therapy applied to certain hereditary diseases was not yet on the threshold, but that no taboos should be laid on future possibilities.

It is the duty of every responsible scientist and of the competent State Organizations to exclude any abuse of gene technology for inhuman purposes. We have all the necessary legal provisions to this end in the GDR.

Genetic engineering has already given new dimensions to biology and medicine, although gene therapy is not yet in sight and will presumably be applicable only later for a few hereditary diseases. Thus for the future, family counseling, prenatal diagnoses and screening tests will remain the means chosen to eliminate as far as possible the effects of genetic defects.

9018

CSO: 2302

GERMAN DEMOCRATIC REPUBLIC

TRENDS IN INDUSTRIAL MICROBIOLOGY NOTED

East Berlin DIE WIRTSCHAFT in German Vol 35 No 3, 6 Mar 80 and No 4,  
3 Apr 80

[Article by Guenter Vetterlein, director, Scientific and Technical Center for Technical Microbiology, Leipzig, Ministry for Chemical Industry, and chief, "Microbial Feed Protein" Product Group: "Development Trends in Industrial Microbiology"; "Microbial Protein Synthesis for Feed First"]

[No 3, 6 Mar 80 p 27]

[Text] There is an old tradition of microbiological production processes in alcoholic fermentation. But it is only during the past 10 years that the microbiological industry has become an independent branch of industry and, until now, it is in the USSR that it has found the highest degree of production organization, under the direction of the microbiological industry administration of the Council of Ministers of the USSR.

In its session of 3-4 July 1978, the plenum of the Central Committee of the CPSU [Communist Party of the Soviet Union] has decided, among others:

- to make available investment capital amounting to 2.9 billion rubles to increase the production of fodder protein, amino acids, biocatalyst mixtures, enzymes, fodder antibiotics, vitamins for feeding purposes, microbiological plant-protective agents and bacterial fertilizers by the microbiological industry under the 11th Five Year Plan 1981-1985;
- to provide for the opening of new production capacities for the production of microbiological products, especially for use in agriculture, among which: 1,210 kilotons of fodder yeasts, 21 kilotons of lysine, 7.3 kilotons of microbiological plant-protective agents.

In the GDR also, following the guidelines of the Ninth SED Congress for the Five Year Plan 1976-1980, the development of microbiological production has begun and will be continued during the period 1981-1990.

Microbiological processes are complex processes in which living microorganisms (bacteria, yeasts, fungi, algae) realize the transformation of substances. They are increasingly used industrially for particular purposes, above all:

- in the foodstuff and luxury food industry, to produce alcoholic beverages through fermentation;
- in the pharmaceutical industry, to produce antibiotics;
- in the chemical industry, but also in other branches, for instance to recover proteins, amino acids, organic acids and enzymes from secondary products; these products are then used themselves in the various sectors of the national economy (agriculture, foodstuff industry, chemical industry, public health).

In the future, microbiological processes will find more extensive and numerous applications in the field of raw material development and environmental protection.

The extensive application of these processes is due to the many special natural characteristics and capabilities of microorganisms:

- to multiply rapidly, thus forming a biomass (cell substance synthesis);
- in addition to cell substance and as part of their own metabolism, to form enzymes which catalyze the transformation processes of their own cell substance, and other products either as so-called primary or secondary metabolites, or as final products of their energy metabolism, all of which can then be extracted from the biomass or from the culture solution (formation of products);
- to catalyze certain chemical transformations of the substrate with special enzymes which form during metabolic processes, so that special reaction paths become possible which could not be mastered economically, or not at all, through purely chemical methods (transformations);
- to use, as a source of carbon for cell substance synthesis and energy production, substances which would otherwise be difficult to utilize for material economy or energy related applications (secondary raw material utilization);
- to use, in their metabolic processes, organic or inorganic components detrimental to the environment and thereby to contribute to clearing the environment (environmental protection).

A few important examples could be used to illustrate development trends, as follows:

## Microbiological Protein Synthesis

Protein synthesis is one of the most important tasks. Microbiologically produced protein is becoming increasingly important in securing man's food supply. The next issue of this publication will dwell more extensively on these problems.

### Amino Acids

Amino acids, like vitamins and nucleotides, are low molecular building blocks of the cell substance. Proteins consist of 20 different amino acids. A few amino acids are essential in human and animal alimentation because they are required to build the body's own proteins, and cannot be auto-synthesized as in plants and microorganisms.

The biological synthesis of amino acids, compared to chemical synthesis, has the advantage that it produces almost exclusively amino acids with the L configuration required by the body, and that it is not necessary to separate the D form from the (racemic) mixture (the L and D configurations of amino acids differ through their optical activity).

L-lysine (USSR, Japan) and L-glutamic acid (mainly in Japan) are produced in large quantities.

L-lysine is very important in increasing the practical value of cereal-based fodder mixtures since cereals have a relatively small L-lysine content. In certain feeding diets, 1 ton of lysine (calculated as monohydrochloride) has the same effect as 12 tons of digestible raw protein of animal or microbiological origin.

In the coming years, we can expect that efforts will be undertaken on an international scale to produce other essential amino acids--mainly L-tryptophan and L-threonine--by microbiological methods.

### Citric Acid

In the beverage, foodstuff, pharmaceutical and detergent industries, there is a steadily increasing need for citric acid which occurs as an intermediate product in the intermediate metabolism of organisms. Citric acid is produced on a technical scale by culturing the *Aspergillus niger* mold on glucose (sugar). In addition to the so-called surface process which has been in use for a long time, the strains cultured today are mainly those which enable submersed citric acid production, i.e. in fermentators. After precipitation with calcium, the citric acid can be separated from the culture solution.

The yeast *Candida lipolytica* can also provide an overproduction of citric acid from n-paraffins. Further development work is necessary to permit industrial production.

## Antibiotics

What we call antibiotics are certain secondary metabolites of microbial metabolism which inhibit the growth of other microorganisms, or kill them, and therefore have acquired therapeutic importance. They are formed by certain bacteria and fungi (mainly from the species *Bacillus*, *Streptomyces*, *Actinomyces*, *Penicillium*, *Aspergillus* and *Cephalosporium*) at the end and after completion of the growth phase of the cell substance.

The development trends in antibiotic production are mainly characterized by:

- the culture and selection of mutant microorganisms of increasing efficiency;
- a solution to the resistance problem which results from continued use of certain antibiotics in animal feed and in veterinary and human medicine;
- the utilization of complex culture media;
- the refinement of the technical fermentation system, from the culture of inoculation material to the production fermentator, whereby high standards of sterility and process control are mandatory;
- the simplification of the separation and purification processes through selection and utilization of cultures having certain specific characteristics, and through improved separation and purification technologies.

## Enzymes

Enzymes are high molecular proteins which are produced by all living organisms and possess biocatalytic properties necessary for the metabolic processes and growth of organisms. A large proportion of enzymes is stored in the cells, where they form approximately 90 percent of the cell proteins (intracellular enzymes). Microorganisms, however, also secrete extracellular enzymes, the biocatalytic action of which decomposes macromolecular substances such as starches and proteins to low molecular building blocks, since only these can be taken up by the cells.

The main application fields are:

- in medicine, as diagnostics for diagnosis and therapy;
- in the foodstuff industry, for instance to ripen cheese and meat, in the production of baked goods, fruit and vegetable juices, glucose, and in the liquefying of sugar, as well as in preserving foods;

- in the beverage industry (brewing and distilling) to decompose starches and cellulose into fermentable sugar, to produce malt, and to reduce the dextrin content in beer production;
- in the chemical industry, as detergent additive for the removal of protein stains, as well as for the decomposition of gelatine in the film industry;
- in agriculture, as feed additive, ensilage and preservation agent, and to increase the protein content of fodder.

Enzyme production, like antibiotic production, places high requirements on the engineering of facilities: in addition to sterilization of the facilities, special measures must be taken to handle the enzymes with great care after their separation. The economy of the processes is largely dependent on the use of productive microorganisms, on a high degree of activity of the enzymes produced, and a high degree of development of facilities engineering.

[No 4, 3 Apr 80 p 25]

[Text] To supply mankind with high-grade protein is one of the problems central to the fight against hunger in the world, and to good nutrition (see DIE WIRTSCHAFT No 3, 1980, p 27).

Despite considerable efforts in many countries to obtain monocellular protein directly for human alimentation, in the form of food additives to increase the nutritional physiological value, or to produce new protein foodstuffs through artificial structuration and texturization of protein isolates into meat substitutes having a high nutritional value, development in this direction during the next 10 to 20 years will still not acquire a decisive national economic significance compared to traditional foodstuffs.

For the time being, the importance of microbiological protein production lies mainly in the production of fodder protein. Because of its composition, the biomass of yeasts, bacteria or algae can replace protein fodder such as fish meal and soy extraction grit, especially in hog, fowl and calf production, or it makes it possible to increase considerably the effectiveness of production where until now, because of a protein shortage, no optimum feeding with well-balanced rations had been possible. This is especially important under conditions of industrial animal production.

Microbiological protein in the form of fodder yeast has been produced for over 40 years now from molasses or molasses slops, lignin from the cellulose industry and wood hydrolyzates. The GDR has also had such a production for a long time, and its development is coordinated by the Microbial Feed Protein product group created in 1977 and placed under the direction of the

Leibniz Institute and Technical Center for Technical Microbiology. To it belong, among others, the enterprises for the production of baker's yeast of the VEB Brau Trade in Magdeburg, of the VEB Fermentation Chemistry in Dessau, of the VEB Photochemical Combine in Wolfen, of the VEB United Cellulose Works in Pilsna, of the VEB Cellulose and Paper Factory in Bismuthal/Blackenstein, and of the VEB Oil and Margarine Factory in Magdeburg.

The Soviet Union has the largest goods production in this field. During the last few years, it has consistently developed an industry based on purified by-products from petroleum, in addition to traditional raw materials such as cotton and wool hydrolyzates, corn cobs, cotton bolls and sunflower hulls. Production in the USSR amounted to over 1 million tons of baker's yeast in 1978.

#### International Development Trends

The scientific and technological development of microbiological protein production is accelerating, especially in developed countries which do not have sufficient domestic sources of fish meal or soy extraction plant supplies and, in the long term, cannot or will not cover their requirements solely through importation. Besides, the soy meal and fish meal extracts are not in a position to cover the protein deficit of the world.

Countries which have reached a high level of development in this field are, therefore, among socialist countries, mainly the USSR, the GDR and Czechoslovakia, and Great Britain, Japan, France, Italy and the FRG among capitalist countries. The microbiological production of protein, however, is meeting with increased interest in Cuba, Bulgaria, Poland, Romania and India, as well as in Arab countries.

The raw material base has undergone considerable modifications. Until about 1970, production relied exclusively on lignin, molasses or molasses slices, wool hydrolyzates, and residues of the sunflower, cotton and corn processing. Before 1980-1985, in addition to the raw materials already used (oil utilization and exploitation of which is aimed at) petroleum products will become increasingly important. Before 1990, the industrial production of microbiological proteins from methanol will have been introduced in various countries; the British firm ICI had planned to put the first production facilities into operation already in 1979, to produce approximately 70,000 tons per year; in addition, work is in progress to utilize natural gas as well as industrial and agricultural secondary raw materials. After 1980, agricultural waste products will be considered increasingly as raw materials for microbiological processes, since they represent practically unlimited resources and grow back each year. In addition, it appears that protein enrichment of conventional feeders through partial microbiological transformation, mostly of starch-containing elements but also of cellulose elements, is gaining in importance.

The steadily increasing burden placed by some industrial products on the environment, and therefore on man's health, requires that the introduction of new products obtained from unconventional raw materials and through new technologies be accompanied by a high degree of safety with respect to the emission of potentially harmful substances, or harmful effects on man. This is why health organizations release such mass products only after they have been proven entirely harmless. While the processes used until now to produce fodder protein have used almost exclusively yeasts as microorganisms, bacteria, algae and Hyphomycetes have recently acquired increasing industrial importance.

In the industrial processes used until now, the microorganism culture is generally stable since--due to the adjusted optimum growth conditions in continuous fermentation--the production culture prevails over the secondary organisms which occur in any fermentation. The selection and culture of new microorganisms with high efficiency factors increasingly requires special measures to prevent the culture from being overgrown by secondary microorganisms.

This is why a few processes require sterilization of the nutrient and trace salt solutions, of the raw material and of the air and exhaust air, to preserve the production culture.

However, we should attempt to use only cultures which do not require any sterilization and still provide stable and high efficiency coefficients in continuous operation.

#### Price Comparison Demands Effective Processes

The progress achieved in the efficiency of technical fermentators have made possible an increase in the effectiveness of existing facilities by increasing biomass productivity and improving substrate utilization through intensive processes. Not all substrates, however, are available in the high concentrations necessary for a significant efficiency increase. In this respect, the fermentation of mixed substrates is offering additional intensification possibilities.

Viewed on an international scale, microbiological protein obtained from petroleum, natural gas, ethanol or methanol cannot compete with present world prices for soy extraction grist. If, in spite of that, research in this field is carried out and investments made all over the world, it is because of the long-term forecasts for protein requirements, of the increasing worldwide protein deficit and of the resulting pricing conditions.

Higher world raw material prices will increasingly force biotechnology experts to exploit microorganism efficiency to the fullest extent, especially with respect to raw material and energy requirements, and to achieve the optimization of the "raw material-microorganism-process-facility-

environment" system. The transformation of petroleum, natural gas and coal into protein, therefore, represents one of the highest degree of refinement of these raw materials which are now becoming scarce.

In spite of this tendency, we must also increase our efforts to utilize agricultural raw materials, and above all secondary raw materials. Models for this are being prepared today; they make possible a complex utilization with simultaneous or alternative production of fodder biomass, energy (methane, ethane) and chemical intermediate products. This opens wide prospects for biotechnology research groups all over the world.

9294

CSO:2102

## BACTERIAL ENTEROTOXINS AS CAUSES OF FOOD POISONINGS

Budapest MAGYAR ALLATORVOSOK LAPJA in Hungarian Vol 35 No 3, Mar 80 p 184

SCHEIBNER, Gerhard, Dr., professor, veterinary counsellor; Humboldt University, Berlin

[Abstract] Knowledge of the etiology of bacterial food poisonings, especially the non-specific ones, has been expanded in recent years. Increasing attention is devoted to enterotoxins. They have the characteristics of exotoxin and have an enterosorptive effect. Their attachment to the intestinal lumen, heat stability and lability, and their point and mechanism of attack are described briefly. Increased permeability of vessels and increased pancreatic secretion are among their effects. The known enterotoxin-producing bacteria are listed and some of the better known ones are described briefly. The most recent findings on the two enterotoxins formed by *Bacillus cereus* are described in some detail. Two significant facts are quoted: 1) Synthesis of the various enterotoxins is dependent on the plasmids. It is possible to transfer enterotoxin-plasmids from the donor strain to apathogenic recipient strains very different in antigenic structure. 2) There is no direct relationship between serotype and enterotoxin-producing properties of the bacterial strains. No references

2473

CSO: 2502

## IMPORTANCE OF VIRUSES IN THE FOOD ECONOMY

Budapest MAGYAR ALLATORVOSOK LAPJA in Hungarian Vol 35 No 3, Mar 80  
pp 182-183

SZENT-IVANYI, Tamas, Dr., professor, academician; Veterinary Medical  
University, Department of Epidemiology, Budapest

[Abstract] The role of viruses in food production, and their possible effects on the food economy and on the transmission of diseases are defined. Their greater resistance to physical and chemical effects in food than in water, their varying resistance to an acid medium and high resistance to freezing are discussed. Some viruses are stabilized by bivalent cations against heat destruction. Endogenous (primary) and exogenous (secondary) viral food infections are distinguished. A widening range of viruses is recognized as capable of causing zoonoses but the role of food in the transmission process is as yet little documented. Human viruses can be spread by ready-to-consume foods (hepatitis A, poliomyelitis). The isolation of entero-, reo- and adeno-viruses from food are difficult to interpret. The development of effective diagnostic testing methods to detect viral infection of foods is a most urgent task. Reference is made to the Food-Virological Program of the WHO. No references

2473  
CSO: 2502

## BIOMEDICAL AND BEHAVIORAL SCIENCES

## CURRENT TRENDS IN THE QUALIFICATION AND QUALITY CONTROL OF FOOD PRODUCTS

Budapest MAGYAR ALLATORVOSOK LAPJA in Hungarian Vol 35 No 3, Mar 80  
pp 178-180

ZUKAL, Endre, docent, department chairman; KATE [expansion unknown],  
Faculty of Agricultural Sciences, Mosonmagyaróvár

[Abstract] Increasing difficulties in the quality control of food products are pointed out and the internal causes (practices and methodology of control testing) of these are discussed. Quality control has been in a state of transition brought about by advances in food technology. The new properties and impurities of food products require the establishment of new control indices and a new system of production control. The current system can not be expanded further because of a lack of testing capacity and technicians. The selection of new control indices, their standardization and comparison with the old methods, including main component analysis and variance analysis, are discussed. Because of the expense involved and massive number of samples handled, automation would require centralized testing facilities. This is hindered by financial and prestige considerations as well as the lack of trained personnel. Under our limited testing capacities, the increased demand for information must be satisfied by added processing of the test data. It is recommended that much of the daily work of quality control be spent on data processing, and that the problems of specialist training be solved. This presupposes that much time is set aside for such activities in the work plan and that the material requirements are provided. No references

2473

CSO: 2502

## LOSSES IN FOOD PRODUCTION CAUSED BY PARASITIC INFESTATIONS AND POSSIBILITIES OF THEIR REDUCTION

Budapest MAGYAR ALLATORVOSOK LAPJA in Hungarian Vol 35 No 3, Mar 80  
pp 176-178

KASSAI, Tibor, Dr., chief research collaborator, candidate of veterinary sciences; Veterinary Medical University, Department of General Zoology and Parasitology, Helminthological Research Laboratory, Budapest

[Abstract] Two problems are discussed. One: The change in slaughterhouse losses due to parasitic infestations and some deficiencies of reporting back to the animal raisers. Two: The need to distinguish between biological and economic losses due to parasitic infestations, involving complex economic evaluations. Health agency data on meat rejection in 1958 and 1978, because of trichinosis, fasciola hepatica and echinococcus infections, are presented. A great decrease in infections is evident in part because the losses are being paid by the raisers. It is recommended that the reporting back to the latter should specify the type of infestation involved, to facilitate control. More hidden but increasing in significance is the economic damage caused by slight weight losses and incomplete fodder utilization in herds having latent infections. Other factors in animal raising may determine whether these losses are negligible or considerable. Complex studies should be conducted and general guidelines should be set up to judge the economic feasibility of controlling subclinical parasitoses. No references

2473

CSO: 2502

## TEST RESULTS ON FOODSTUFF SAMPLES FOR RESIDUAL PESTICIDES BETWEEN 1974 AND 1978

Budapest MAGYAR ALLATORVOSOK LAPJA in Hungarian Vol 35 No 3, Mar 80  
pp 173-176

AMBRUS, Arpad, department head; Ministry of Agriculture and Food Industry,  
Plant Protection and Agrochemical Center

[Abstract] The properties of various pesticidal residues are analyzed in terms of the safety of consumption of animal products. Barley, wheat, corn, alfalfa, dried alfalfa, sunflower and soy samples numbering in the 10 thousands were tested for pesticide residues. The distribution of residues is tabulated and compared with the maximal allowable limits as defined by the Codex Alimentarius Commission in 1978. The following values are presented in the tables: compound; number of samples; maximal allowable residue in 1979, in mg/kg (T); number of samples containing more than the T value ( $R > T$ ); number of samples in the  $T \geq R > 0.5 T$  range ( $N_1$ ); average residue in mg/kg in the  $N_1$  samples ( $R_1$ ); number of samples in the  $0.5 T \geq R > KH$  range of limits to detection ( $N_2$ ); average residue in mg/kg of the  $N_2$  samples ( $R_2$ ); number of samples containing residues below the limits of detection ( $R < K$ ). Detectable residual values of only a few compounds were found in a small percentage of samples. Chlorinated hydrocarbons were found rather frequently in spite of the fact that their use was banned between 1968 and 1970--with the exception of lindane and endosulfane--because of their slow elimination from the soil. In general, the amount of residual pesticides is considerably below the allowable values, in Hungary. No references

2473

CSO: 2502

# NEW LASER CONTROL SYSTEMS DESCRIBED

Warsaw POMIARY AUTOMATYKA KONTROLA in Polish No 5, May 80 pp 193-194

[Article by Engineer Wladyslaw Gorali: "New Developments of MERA-PIAP--Laser Control Systems"]

[Text] A number of laser systems for automatic control of engineering machinery used in land-reclamation and earth-moving operations (road construction, ground leveling for construction, drainage work, etc) was developed within the framework of the POLMATIK National System of Automation and Measurements (METROKIN subsystem, systems for measuring traffic parameters) at the Industrial Institute for Automation and Measurements "MERA-PIAP" in Warsaw.



EL-4 Laser Control System



EL-5 Laser Control System

#### UL-4 Laser Control System

This system (see diagram) is used for automatically holding a designated position of the TD-25C caterpillar tractor in relation to a laser beam. The UL-4 system controls the penetration and tilt of the blade in relation to the plane of the laser light. This provides the capability of conducting earth-moving operations which form flat surfaces on a laser plane. This control system may also be applied to other tractors, on which the operating units are controlled by electrohydraulic distributors.

#### UL-5 Laser Control System

This system (see diagram) is used for automatically holding the operation elements of engineering machinery at a designated depth in relation to the plane of the laser light. The system is used for holding either a bulldozer blade or drainage excavator blade at a fixed depth. The system may also be applied to other machinery, on which the operating units are controlled by electrohydraulic distributors.

The aforementioned systems are composed of the following units:

- UL-DN2 laser radiation detector designed for the reception of pulse light of the revolving laser beam;
- UL-M3 guide mechanism designed for the vertical movement of the UL-DN2 detector;
- UL-B2 or UL-B4 control unit designed for converting electrical signals produced by the detector to electrical signals which control the electrohydraulic operating units;
- UL-S3 or UL-S4 control panel used for transmission of control signals by the operator.

The UL-4B laser transmitter produced by the Polish Optical Plants was used to produce the light plane. The transmitter has the following parameters:

- Ar-Ne laser: continuous;
- diameter of the beam on emission: 15 mm;
- beam divergence:  $\pm 5$  mm/100 m;
- light signal strength on emission:  $2 \text{ mW} \pm 0.5 \text{ mW}$ ;
- power supply voltage: 12 V.

Technical information is provided by: Industrial Institute for Automation and Measurements "MERA-PIAP," Center for Electrical Automation, 202 Jerozolimskie Aleja, 02-222 Warsaw, Telephone 23-70-81, Extension 348, Telex 814471 PL. Producer: Industrial Institute for Automation and Measurements "MERA-PIAP," Experimental Plant, Jerozolimskie Aleja 202, 02-222 Warsaw, Telephone 23-76-16, Telex 814471 PL.

# Technical Data of the Systems

	UL-4	UL-5
Function	Conversion of mechanical input quantity to electrical output quantity	
Input quantity	Position of laser radiation detector in relation to the plane of the laser light	
Output quantity	Two-phase voltage signals having 0 value of 24 V [unit system]. Load resistance $\geq 10 \Omega$	
Maximum distance of measuring system from the light source	250 m	
Inaccuracy of holding the operating element at the designated level in the entire allowable operating range	$\pm 1 \text{ cm}$ (measured at the edges of the blade)	$\pm 1 \text{ cm}$
Power supply voltage	24 V + 6 V direct current 3 V	
Power input	minimum 35 W maximum 230 W	minimum 30 W maximum 130 W

CSO: 7602

# NEW, CHEAP INFRARED-DETECTOR MASS PRODUCTION METHOD DEVELOPED

Warsaw PRZEGLAD TECHNICZNY INNOWACJE in Polish No 19,11 May 80 pp 10-11

[Interview with Doc Dr Hab Jozef Piotrowski of the Military Technical Academy by Bozena Sawa of PRZEGLAD TECHNICZNY INNOWACJE: "Scientific Adventure With Infrared Detectors"]

[Text] [Question] As a result of research conducted by a team from the Institute of Technical Physics of the Military Technical Academy and the Mining Electronics Plant, we are initiating in Poland, in Tychy, at that same plant, manufacture of the first Polish semiconductor detectors for the intermediate infrared region. It is true that the only item presently in production is a photoresistor for the 3-5.5 micron band, but manufacture of subsequent items is only a matter of time. They say that these detectors have numerous, very important applications.

[Answer] Infrared detectors are utilized in mining, medicine, and space research. Extensive applications of infrared devices in military equipment, particularly for guidance systems, date from World War II. Uses include guiding rockets and bombs to the target, seeking out targets, as well as battlefield surveillance at night and in poor visibility conditions. In the space program they are employed for detecting objects on the Earth, scanning for warm spots (for example, locations of vehicles or missile launching locations), fires, and heated areas (this technique can be employed, for example, to detect underground fires). Infrared devices can be employed to spot schools of fish and to detect a submerged submarine (on the basis of change in the temperature of the sea surface, measured from space with the aid of infrared devices). Infrared devices can also be employed to analyze the composition of the atmosphere and to examine directly from space the content of various elements in the Earth's crust.

[Question] Detectors are not a new thing. They were discovered long ago.

[Answer] The first infrared detectors date from the last century. These were so-called thermal detectors. They employed the principle of conversion of the energy of infrared radiation into thermal

energy, which was then converted into electric energy. Semiconductor detectors were invented in the 1930's. In these detectors radiation energy is converted directly into an electrical signal. These are characterized by a high sensitivity and rapidity of reaction to radiation. Various semiconductor materials are employed in the construction of such detectors.

[Question] Your research involved cadmium-mercury telluride. Why?

[Answer] This is a material possessing unique physical properties and considerable applicational significance. It was first employed in building detectors by Lawson in England. Research was subsequently conducted at many facilities throughout the world. Poland also has a considerable research tradition in this area. Incidentally, large research teams worked on this material for many years at the Polish Academy of Sciences Institute of Physics. Basic research conducted there, however, involved certain fundamental properties of this material. While working on professor E. Igras's team, I became interested in the possibilities of applications and development of a process for producing a material suited for designing detectors of various type.

[Question] These detectors have been produced for almost as many years as have passed since their discovery.

[Answer] Of course cadmium-mercury telluride detectors have been produced for a fairly long time in the West, particularly in the United States, France, and the FRG... They are very expensive. The price of the cheapest runs several thousand dollars. In addition, there is essentially an embargo on sale of such devices to Poland. The price is so high because these detectors are produced in those countries by very complicated, low-productivity and costly methods, which is connected with the specific properties of cadmium-mercury telluride.

[Question] One can say then that your team has accomplished something new on a world scale. Those same detectors, but produced by a new method?

[Answer] An inexpensive method, permitting fairly cheap, mass production. And that is not all. We have also obtained for the first time new types of devices, such as uncooled detectors in the 8-14 micron band. Demand for such detectors arose in connection with the development of quantum electronics, especially in connection with the need for detection of 10.6 micron laser radiation emitted by a carbon dioxide laser. As we know, this is the most efficient of all lasers, is relatively easy to build, highly efficient, very high-powered, and with fairly broad anticipated application. Detectors employed up to the present time to detect radiation from such a laser have required deep refrigeration down to the temperature of liquid nitrogen and have been very expensive. We have succeeded in developing a unique detector for this frequency range, which operates at room temperature. Of course its sensitivity is lower than

cooled detectors, but it is still sufficiently high so that the detector can be utilized in laser emission research. This detector is also characterized by a very high reaction rate, which was required for research. These detectors are employed not only to detect a laser emission and to determine its properties, but also, for example, to study the effect of emission of a laser beam with matter (in experiments involving laser thermonuclear microsynthesis). An 8-14 micron unrefrigerated photoresistor was the first detector developed by us. It was produced for several years on a laboratory scale and utilized in scientific research at various establishments. We have recently received many inquiries from capitalist countries pertaining to export of these devices, and we anticipate increasing production. I also believe that we are the first to develop an uncooled 3-5.5 micron photoresistor employing a thin-film process. In the past such devices for this frequency range were obtained only with employment of crystalline material, utilizing the costly Bridgeman method. For the first time we have obtained a material utilizing cheap thin-film methods developed by us.

[Question] You said 'I believe.' Aren't you sure?

[Answer] As I have stated, cadmium-mercury telluride is widely employed in military equipment. Research and applications are kept secret, and therefore it is difficult to verify the current state of the art. And in fact I am unable to state for sure that we are ahead of other people working in this field. I am simply saying that we have succeeded in advancing research on some types of detectors in comparison with other research establishments. Other laboratories are ahead of us in other areas.

[Question] Let us talk about your discovery. In precisely what does the new, cheap method of producing intermediate-infrared mercury-telluride detectors developed by your research team consist? In what way is it different from the traditionally employed methods?

[Answer] It is rather complicated. The detectors are made of a ternary semiconductor compound: an alloy of cadmium telluride and mercury telluride. In order to utilize it, it is necessary to obtain a highly homogeneous material with good physicoelectrical properties, which is a very difficult task. It is a unique material, for it changes across a broad range such an important characteristic as energy gap, due to which it can be employed as a versatile material for building infrared detectors covering a very broad spectrum, from ultraviolet through the visible spectrum, near, middle and far infrared. Precisely this additional degree of freedom, however, namely its energy gap change capability, at the same time causes great difficulties, for together with change in composition there occurs change in that energy gap, and we obtain a material with different properties, not those which are needed for practical application.

[Question] You have stated that it is a difficult material. Why?

[Answer] Most frequently crystalline material is produced by the method of directed crystallization from the liquid phase, by the Bridgeman method. Problems arise here, however, connected with segregation of the constituents of this alloy. We obtain a material which is highly inhomogeneous in composition, which makes its practical application difficult. For practical purposes, in order to obtain detectors it is necessary to perform many procedures involving costly cutting of wafers, thinning, and painstaking chemical treatment and mechanical working of the surface. Since the material is brittle and fragile, this work is troublesome and difficult. This is the reason for the high price, which I have already mentioned. And our method? We have developed a method of obtaining homogeneous layers of this material suitable for building detectors. We obtain layers which are exceptionally homogeneous in composition, much more homogeneous than those obtained with any other previously known method (especially more homogeneous than with the Bridgeman method and its modifications), and also more homogeneous than in experiments conducted in space during the "Siren" experiment designed by Polish scientists from the Polish Academy of Sciences Institute of Physics.

[Question] Encountered applications require detectors of different types.

[Answer] That is true. And therefore what I have stated does not apply to the entirety of research work. The next stage was investigation of the different properties of these layers. These included structural, optical, electrical and photoelectric properties. This was followed by development of a process for producing infrared detector photosensitive elements, research on various types of such detectors, and in the following stage -- utilization of these detectors for designing instruments of various kinds. We employed various photoelectric phenomena for designing detectors. The most important of these were the following: photovoltaic effect, photoconduction effect, and photomagnetoelectric effect. I and my colleagues at the Military Technical Academy worked with all three effects. Depending on the specific application (that is, depending on the detector's operating spectrum and temperature), a specific type of detector is optimal. Much of our research was connected specifically with elaboration of criteria for selecting an optimal type of detector and theoretical determination of the boundaries of parameters of detectors operating under various conditions. The work on detectors within of these theoretical boundaries of parameters is essentially completed, and at this time one can fairly easily state what detector can be selected for a specific application.

[Question] How long will you be working on these detectors?

[Answer] Many problems remain to be solved. At this time we have put into production only the first, simplest element: a 3-5  $\mu$  micron photoresistor. This will be produced at Izyur, at the Mining Electronics Plant. This device will be designated for application in various equipment for mining, primarily in instruments for detecting gases in mine air, such as

carbon dioxide, carbon monoxide, and methane, as well as in instruments employed for remote temperature measurement. We are working on gas analyzers for mining applications jointly with the Mining Electronics Plant in Tychy. Working jointly with the Motor Transport Institute in Warsaw, Radiotechnika in Wroclaw, and the Higher School of Engineering in Radom, we are working on gas analyzers for internal combustion motor diagnosis. Monitoring the composition of motor exhaust gases makes it possible to improve engine efficiency (fuel economy) and to reduce emissions of toxic gases into the atmosphere.

[Question] Mines have had equipment for gas detection for many years. What is the advantage of infrared equipment?

[Answer] First of all, selectivity. Gas analyzers, utilizing the effects of infrared absorption by gases, measure each gas in a mixture separately, and the presence of other gases does not affect the measurement result. These analyzers can detect certain gases (CO<sub>2</sub>, for example) which are difficult to detect with simple methods. These analyzers are also characterized by small size, modest power requirements, resistance to impacts and vibrations, and a high degree of reliability. These advantages are possessed in particular by semiconductor infrared detectors, such as the 3-5.5 micron photoresistor we have developed.

[Question] In what other sectors of the economy can 3-5.5 micron photoresistors be used?

[Answer] After developing 3-5.5 micron photoresistors, we worked on development of remote temperature measuring instruments. These instruments were subsequently developed and are going into production at various establishments -- primarily at the Foundry Institute in Krakow (photoelectric pyrometers and industrial automatic control heat sensors). Photoresistors were also employed in prototype equipment developed outside the Military Technical Academy: for railroad-car axle temperature monitoring (Gdansk Polytechnic Institute), and to protect cutting tools against excessive wear (Indukta Electrical Machinery Plant in Bielsk-Biala). Important advantages of employing photoresistors in equipment of this type include a high rate of operation and spectrum characteristics shaping capability, which makes it possible to obtain optimal adjustment to a specific range of measured temperatures and to avoid the influence of interference caused by change in properties of the atmosphere (for example, change in humidity).

Doc Dr Hab Josef Piotrowski: approximately 70 publications, a dozen or more patent applications, twice recipient of the Minister of National Defense Prize, recipient of the Prize of the Secretary of the Scientific Division of Technical Sciences of the Polish Academy of Sciences, three-time recipient of the Prize of the Rector of the Military Technical Academy, awarded honorary title of Mine Rescue Worker (for his mine rescue instruments), and the title Military Efficiency Innovator.

## POLISH ACADEMY OF SCIENCE ACTIVITIES, PERSONNEL

Warsaw NAUKA POLSKA in Polish No 12, Dec 79 pp 133-150

Excerpta/ Fourth Biophysical Congress

The Fourth Polish Biophysical Society Congress, which met in Porabka-Kozubnik (Bielsko Biala voivodship) October 23-24, 1979, presented achievements in the field of molecular physics and higher-organized biophysical organisms (plant, animal, human) and compared recent attainments in molecular biophysics.

About 180 specialists from throughout the country as well as foreign guests took part in the proceedings. Conferences of the Polish Academy of Sciences Biochemistry and Biophysics Committee and the Physical Medicine Committee took place under the sponsorship of the Congress.

## Water Resources

Chapter Five-Earth Sciences of the Gdansk Science Society, Geography Institute, Gdansk University and the Environmental Protection Department, Warsaw University, held a scientific meeting in Gdansk on October 18-19, 1979, on water resources of the Kashubian Lake District and its importance in supplying water to the Gdansk urban center.

The conference program consisted of 15 papers followed by discussions. Distinguished experts and other specialists evaluated water resources in the Gdansk region and presented proposals and solutions for proper management of water resources, of which there is a shortage. The water shortage, it was emphasized, may become an obstacle in the path of future sociopolitical development of large industrial and urban centers. Wasteful management and lack of effective countermeasures to water pollution may cause irreparable losses.

A conference on efficient management and protection of water resources in the Swietokrzyskie Mountains was held in Kielce on October 22-23, 1979, sponsored by the Swietokrzyskie Section of the Hill Country Management Committee, Polish Academy of Sciences.

The conferees became acquainted with local problems by visiting points along the following route: Kielce, Sitkówka Nowiny, Jaskinia "Paradise", Checiny, Brzegi, Galezice, "Ostrowka" coal mine. The problems were presented in the papers that were read; they concerned the general condition and water management prospects in this region; tasks in the field in the light of the "Wisla" program; results of work done on forecasting the effects of deep exploitation of quarries on water conditions in Bialy Zaglab and Miedzianka; management of the Nida river basin with particular attention to the "Checiny" reservoir; and tourist frequency in the so-called "Checinski Sea" region. The effects of water exploitation and mine dewatering on water conditions and also the effects of atmospheric pollution on the chemical composition of underground waters, etc., were discussed.

#### Environmental Protection and Development Problems

The Council of Ministers Planning Commission, Polish Academy of Sciences Science Committee "Man and His Environment", and the Piotrkow Trybunalski voivodship office, organized a scientific session on the subject of environmental protection and development in the central macroregion (comprising eight voivodships: Warsaw Capital, Lodz City, and Plock, Radom, Sieradz, Skierniewice, Ciechanow and Piotrkow Trybunalski. The meeting took place October 23-24, 1979 in Piotrkow Trybunalski.

In addition to the scientific workers, the conference was attended by representatives of the Council of Ministers Planning Commission, representatives of the party authorities and the Ministry of Administration, Local Economy and Environmental Protection.

The conference was opened by Stanislaw Skladowski, first secretary, voivodship committee, PZPR. Then the chairman of the "Man and His Environment" Science Committee, Wlodzimierz Michajlow, Polish Academy of Sciences, read a paper on the subject of the role and goal of science in rational environmental protection in the country and the world. Later the Piotrkow Trybunalski governor, Dr Leszek Wyslocki, discussed, on the basis of the experience in the Belchatowski Industrial District, the matter of neutralizing negative phenomena in the natural environment; Andrzej Pyszkowski, director of the regional planning team in the town council planning commission, and president of the Polish Town Planners Society, spoke of the need to correlate environmental protection activities with socioeconomic development plans and territorial development of the central macroregion. Also, the assistant director of the Environmental Development Institute of the Ministry of Administration, Local Economy and Environmental Protection, Elzbieta Wysocka, related problems connected with the Ministry's coordinating role, and Prof Barbara Prandecka, assistant dean, Main School of Planning and Statistics, spoke on the economic aspects of environmental protection. In addition, papers were presented by representatives of the individual voivodships and ministries.

The session's participants visited the site of the future Belchatowski Industrial District, the "Paris Commune" Industrial Plants in Radomsk, and the largest production enterprise in the Piotrkow Trybunalski voivodship, the "Chemitex-Wistom" Chemical Plant in Tomaszow Mazowiecki.

The Katowice Chapter of the Nikolaï Kopernik Polish Naturalists' Society and the Silesian University Botanical Institute in Katowice organized the Fourth Scientific Meeting, titled, "Environmental Protection Problems in the Upper Silesia Industrial District". It took place on October 23-24, 1979 in Zabrze and attracted leading specialists from scientific institutions and production enterprises of this region, involved in environmental protection problems in this heavily industrial area.

The papers presented described problems of air pollution, changes occurring as a result of toxic agents, soil and water pollution. They represented the results of the latest research by Polish naturalists.

#### Problems in Development of the Wisla River

A Polish-French colloquium was held in Warsaw on October 11-13, 1979 on the development of the Wisla River. It was organized by the Agency for Technical, Industrial and Economic Cooperation (ACTIM) in Paris and the French Scientific-Technical Documentation Institute in Warsaw.

The Polish and French specialists displayed their experience in the comprehensive development of large rivers. In connection with this, such topics were discussed as: the economic consequences of comprehensive development of rivers based on the Rodan experience; automation of low-fall dams; characteristics of planning hydrotechnical undertakings in the light of the present progress in the "Wisla" program; effect of river development on natural environment conditions; and use of sediments for landscape and farming purposes.

A meeting of the Scientific and Technical Publicists Club of the Association of Polish Journalists was held in Gdansk on October 18-19, 1979 on problems in developing the estuary of the Wisla.

The discussions were based on presentations by representatives of the voivodship offices in Gdansk, the Maritime Institute, the Bureau of Territorial Planning, the Bureau of Water and Land Reclamation Projects, the port of Gdansk, and "Gdansk Navigation". They touched upon the naturalistic features of the Wisla estuary and its sea-river advantages, siting of water-intensive industries in this region, and use of the advantages of the Wisla estuary for barge transport. There were also discussions on the question of an activation plan for the river estuary and water-reclamation development of the Zulawy. The various aspects of developing the Wisla estuary were discussed in the context of a nationwide program for its exploitation, and also in connection with development of the Tricity ports and the Gdansk urban center. Considerable attention was given to the matter of the interdependence and conflicts between industrial and agricultural functions of different units of the Wisla River territorial-development complex.

The Chief Technical Organization was the organizer of the nationwide scientific-technical conference on the comprehensive exploitation of the water

resources of the Wisla and its river basins. It was held in Warsaw on October 22, 1979. The chairman of the Committee of the Council of Ministers for the Wisla Development Program, Kazimierz Secomski, Polish Academy of Sciences, took part in the deliberations.

Development and implementation of a program for developing the Wisla was discussed, as well as basic problems relating to development and exploitation of Wisla resources for economic needs, pureness of the water from this river and its branches, regulation of water relations in the Wisla River basin from the viewpoint of intensification of agricultural production and the food economy. In addition, such problems were discussed as: effect of measures taken for territorial development of the country and its individual regions, development of tourism, natural environmental protection and the need to become acquainted with geological and topographic conditions for planning, designing and realizing investment undertakings encompassed in the "Wisla" program.

A conference organized by the Town Planning and Architecture Commission and the Commission for Water Management of the Krakow Branch, Polish Academy of Sciences, was held in Krakow on October 29-30, 1979. The conference was on the problem of developing the Upper Wisla and its landscape. A number of scientists representing various scientific disciplines relating to water management and landscape development participated in the conference.

Reports were made on the following: the status of research on assessment of water resources in the Upper Wisla river basin, water quality, and sanitary protection. Several papers were presented on the present state and future prospects of hydrotechnical development of the Upper Wisla and its river basin and hydrogeological problems. It was stressed that the area discussed, which is heavily populated and industrialized, is a region in which, when the river swells, there is a large surplus of water, and when there are dry spells, there is a water shortage. It is important that in achieving planned technical and economic results, damage to the natural environment must be reduced, and that it be protected from unnecessary devastation. It was postulated that the entire area of the Wisla proglacial stream valley be immediately divided into three zones: a protection zone with preserves and protected landscape areas (e.g., Niepolomicka Wilderness, Tyniec, Bielany and Dabniki, near Krakow; a transformation zone, in which in accordance with suitably prepared recommendations, landscape changes can be made; and a reclamation zone, encompassing areas in which the natural landscape was devastated but which cannot be restored. During the discussion attention was concentrated on improving water management, the prospects of transforming the Wisla into an important transport route, and on ways to protect the environment and the Wisla River landscape.

The conferees visited the Ojcowski National Park and the Pradnik Valley.

### Nuclear Power Industry

The Institute for Nuclear Research in Swierk and the Association of Polish Electrical Engineers held a scientific-technical conference entitled, "The Nuclear Power Industry in 1979", on October 2-3, 1979 in Swierk, near Warsaw.

Scientific-research attainments in the nuclear power industry and guidelines for research tasks relating to the envisaged growth of nuclear power in Poland were presented. There was confirmation of the need to build nuclear power plants due to the recent world fuel crisis, for only they will be able to satisfy the growing demand for electrical energy. It is anticipated that by the year 2000 several nuclear energy heating plants will be constructed, furnishing thermal energy for municipal needs.

### Information Science in Geodesy and Cartography

The Association of Polish Geodesists, jointly with the Geodesy and Cartography Computerized Information Center and the Geodesy-Cartographic District Enterprise in Lublin, held a nationwide scientific-technical conference on October 17-19, 1979 in Kazimierz Dolny and Lublin on the development of geodesy-cartographic information science.

Over 100 specialists took part in the conference, representing the Institute of Geodesy and Information Science of the Warsaw Polytechnical School, the Academy of Mining and Metallurgy in Krakow, the Techno-Agricultural Academy in Dzierzyn, the Main Office of Geodesy and Cartography, the "Geocart" enterprise in Lublin, and other high educational institutes and ministries, research and development centers, enterprises and geodesy-cartographic offices throughout the country.

About 30 papers were presented on problems relating to the development and introduction into practice of information science on numerical preparation of maps for various national economic needs including: basic maps, land files, and for planning purposes, a complete geodesy-cartographic information system on the locality. The geodesists and computer scientists from the Geodesy-Cartographic District Enterprise in Lublin described their information science achievements and announced the installation, in their enterprise, of the first third-generation "Geo-20" minicomputer system in this subbranch. The conference was apprised of the most important socioeconomic changes in the Lublin region and of the attainments of Lublin geodesy during the 30 years of the Polish People's Republic.

### Outer-Space Law

The First International Seminar on Outer-Space Law -- "Intercosmos" -- was held in Warsaw on October 2-3, 1979. It was sponsored by the Polish Academy of Sciences Committee for Outer-Space Studies, the Polish Astronautical Society and the Association of Polish Lawyers.

Participating in the seminar were distinguished lawyers and specialists in outer-space law from member countries of the "Interkosmos" program: Czechoslovakia, Bulgaria, Cuba, GDR, Poland, Hungary and the USSR. Outer-space law is still in its initial formative phase.

#### Production Planning in Industrial Enterprises

The voivodship branch of the Polish Economic Society in Bydgoszcz, with the cooperation of the Techno-Agricultural Academy, the "Predom-Romet" Cycle Plants, and the Polish Academy of Sciences Institute for Systems Studies, held a nationwide scientific conference on September 27-28, 1979 in Bydgoszcz on the topic: "Production Operational Planning Systems in Industrial Enterprises".

The conference was attended by representatives of many scientific-research centers, information scientists, and managers of industrial production enterprises.

The 13 papers presented covered such subjects as the possibility of broader inclusion of computerized information in management processes and improving them in undertaking correct decisions in the area of problems relating to management efficiency and overall enterprise competence.

#### Electrical Machines Containing Permanent Magnets

The Polish Academy of Sciences Chapter of the Electrical Science Commission in Poznan, the State Enterprise Industrial Electrical Engineering Institute, and the Technical Progress Center in Katowice, sponsored an international scientific-technical conference on the topic, "Electrical Machines Containing Permanent Magnets". It was held on December 9-10, 1979 in Katowice.

The problems discussed concerned permanent magnets for electrical machines, design, construction and technology of electrical machines containing permanent magnets, and applications of these machines.

In conjunction with the conference, there was an exhibit at which were displayed electrical machines, permanent magnets, magnetizing equipment, and equipment for conducting studies.

#### Growth of Inorganic Crystals

An international scientific conference on research on growth of inorganic crystals was held on October 15-20, 1979 in Radom, under CEMA auspices.

The several papers presented dealt with: The technology and theory of growth inorganic crystals which can be used in electronics, microwave acoustics, memory equipment, quantum electronics, etc., and also physics engineering in liquid crystals used in such equipment as digital indicators (watches, calculators, etc.), alphanumeric and matrix indicators used mainly in information visualization.

Polish specialists have made great achievements in this field of science; their work is known and cited throughout the world. In the Radom School of Engineering, Prof Jozef Zmija, chairman of the Polish Academy of Sciences Crystal Growth Committee, has worked with this for over 15 years.

#### Power Engineers' Symposium in Radom

On the occasion of the 60th anniversary of the organization of the Association of Polish Electrical Engineers, the Radom chapter, the Work Safety Plant of the Power Industry Institute, and the eastern district power industry plants in Radom, held a symposium on October 18-19, 1979 in Radom on the topic: "Theoretical Aspects of the On-the-Job Accident Rate in the Electric Power System".

The symposium was attended by 240 workers from power industry and design plants and scientific research institutions. Discussions were held on specific problems in comprehensive control of activity in the field of work safety and health in the electric power industry. These problems were the subject of 42 papers and reports delivered by scientific representatives, designers, and practitioners in these fields. In addition, there was a demonstration of work safety in use of high-tension electromagnetic equipment. Symposium participants visited the Kozienice power plant, where the prototype 600-MW power units attracted special interest.

In conjunction with the symposium, there was an exhibit of the latest protection equipment, prototype equipment built on the basis of efficiency studies; a book fair with professional publications; and a showing of films on job health and safety.

#### International Cybernetic Symposium

The Lodz Chapter of the Polish Cybernetics Society and the Electronic Computer Center in Lodz sponsored the Fourth Cybernetics Symposium in Zakopane on December 8-13, 1979, under the slogan, "System-Modeling-Control".

The symposium was attended by 230 scientific workers from throughout the country and also from Bulgaria, Czechoslovakia, Holland, GDR, FRG, Romania, Vietnam, and the USSR. The symposium was divided into three problem sections: technical sciences, biological-medical, and socioeconomic. Over 130 papers were read and widely discussed by specialists from various fields of science, searching for uniform systems of information flow by use of cybernetics and also by using controlling and modeling systems in engineering and the biomedical and socioeconomic sciences.

9295

CSO: 1012

## BRIEFS

LOGABAX COMPUTER INSTALLATIONS--The Data Processing Office [ZTS] of the Central Office of Statistics currently has processing equipment which includes six modern Logabax computers of the 4200, 4400 and 4500 series. [Excerpt] [Warsaw WIADOMOSCI STATYSTYCZNE in Polish No 4, Apr 80 p 35]

MAIN STATISTICAL OFFICE COMPUTERS--Organizations of the government Main Statistical Office have a total of 23 computer systems (18 ODRA-1305, 2 ICL, 1 ODRA-1304 and 2 R-32 computers), 51 minicomputers (20 MERA-306, 25 Cellatron 8205/Z and 6 Logabax) and 29 multi-position data registration systems on magnetic tapes that have a total of 403 positions. [Excerpt] [Warsaw STATYSTYCZNE in Polish No 6, Jun 80 p 2]

ENERGY MINISTRY COMPUTER SYSTEM--The computerized information system called "ABSENCJA," which provides the capability of analyzing the utilization of operating time in the ministerial units, is being put into operation at the Center of Information Science for the Power Industry and Atomic Energy with the use of an ODRA-1305 computer. [Excerpt] [Warsaw WIADOMOSCI STATYSTYCZNE in Polish No 6, Jan 80 p 35]

ELECTRICAL ENGINEERING INSTITUTE COMPUTER--At the Institute for Electrical Engineering of the Bialystok Polytechnical School, an algorithm and program were developed for an ODRA-1204 digital computer that provide the capability of computing the optimal design parameters of two-phase, high-level current transformers intended for operation in steel arc furnaces. [Excerpt] [Warsaw POMIARY AUTOMATYKA KONTROLA in Polish No 5, May 80 p 183]

COMPUTER SCIENCE, PRODUCTION DECLINE--The period of information-science euphoria has passed. Certain problems in the field of information science are discussed. RAZEM [source]: Specifically, how many computers do we have in Poland? M. Wajcen [chief specialist at the "MERA" Automation and Measuring Equipment Industry Association]: Approximately 800 computers, excluding minicomputers. There are approximately 2,000 of these small computers. RAZEM: Are all of the computers being utilized? M. Wajcen: I do not know this. J. Kisielnicki [research and development director at the Design and Application Center of the Information Science Association]: I can answer this in another way. In 1976 we produced 105 medium-size computers, in 1977--70, in 1978--60, and in 1979--50; in 1980 we will produce 35 computers in accordance with the plan. This is symbolic. The production of computers is decreasing, but we do not worry about this. M. Wajcen: Outlays for the development of information science are also decreasing. It is currently impossible to purchase hardware. Almost all of it is being exported. The ministries are restricted in purchasing abroad. [Excerpts] [Warsaw RAZEM in Polish No 23, 8 Jun 80 pp 10-11]

POSSIBILITIES OF SEDATION OF CATTLE WITH ELECTRICITY

Budapest MAGYAR ALLATORVOSOK LAPJA in Hungarian Vol 35 No 3, Mar 80 p 186

JANOWSKI, Tomasz, Dr., professor; Agricultural Academy, Krakow, Poland

[Abstract] This is a report of a new procedure referred to as "electro-sedatio bovis" used to sedate or daze cattle by application of special, weak electrical pulses. After a few seconds of visible reaction (tremor of tongue, eyes), the intended handling of the animals can be started. It is suited both for small and more major surgical interventions. Widespread clinical trials with the special instrument are currently in progress. No references

2473

CSO: 2502

TOXIC MICROELEMENTS IN SEAFOOD

Budapest MAGYAR ALLATORVOSOK LAPJA in Hungarian Vol 35 No 3, Mar 80  
pp 187-188

MILOHNOJA, Marjan, Dr., professor; Veterinary Medical University,  
Ljubljana, Yugoslavia

[Abstract] Results of tests on the mercury, lead, arsenic and cadmium content of fishes, oysters and canned fish caught in waters of Yugoslavia and also of various imported seafood are tabulated. Mercury levels were satisfactory but monitoring is needed where the possibility of contamination is present. Lead does not appear to accumulate in fish. Arsenic was lower in fresh water specimens than in sea animals. Monitoring and the establishment of permissible levels is recommended. The few samples tested for cadmium were low in this element. More tests are recommended where contamination is likely, and permissible levels must be established. Detailed regulations are called for on the testing program by the veterinary service and on the arsenic, lead and cadmium tolerance in fishes and shellfish. Efforts must be made to decrease further pollution in any form. No references

2473

CSO: 2502

END

**END OF**

**FICHE**

**DATE FILMED**

31 JULY '80

MAK